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Experimenting in Export Markets

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Acknowledgements

When I first arrived in Brighton from Peru to do the MSc programme in International Economics at University of Sussex, it had never crossed my mind to do a PhD. Then, I was not fully aware of my potential at economic research and, more surprisingly to me, teaching. But establishing a contact with PhD students and faculty members was crucial for me to make a decision. And now, this PhD thesis is the fruit of that decision; certainly, the most important of my life.

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Abstract

My thesis contributes to the firms and trade literature, both theoretically and empirically, focusing on the export participation strategy by firms in one particular market, introducing products sequentially. I illustrate differences in export dynamics between firms according to their experience in that destination, and move further in my analysis by exploring how fast that experimentation is. I am particularly interested in the influence of trade liberalisation, as well as differences between products in terms of production efficiency.

Chapters 3 and 4 present a two-period analysis on firms' sequential exporting strategy to a single destination. Chapter 3 shows theoretically, inspired by Albornoz et al. (2012), that new exporters in a market tend to grow faster in that destination than expert exporters, both at the intensive and extensive margin, across products; but those newcomers are also more prone to exit that business, while trade liberalisation, as well as the focus on "core competence" products, helps new exporters to remain in the market and continue experimenting. With a rich dataset of Peruvian export transactions to the USA market, Chapter 4 backs most predictions from the theory empirically. In Chapter 5, I go deeper into the sequential exporting strategy with a theoretical framework, based on Nguyen (2012), to explain how quickly exporters in one market move from one product to another. I find, supported by empirical evidence, that trade liberalisation accelerates firms' experimentation in that destination.

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1 Introduction

My thesis contributes to the literature by exploring the export entry strategy undertaken by firms in one particular market, by introducing new products sequentially, and the influence of trade liberalisation in these dynamics. My work also takes into consideration differences between products in terms of how efficient firms are in their production, as well as firms' experience selling goods in the market of interest.

My main motivation to address this issue is that there has recently been a growing literature exploring the dynamics of exports at the firm level, usually highlighting the continuous entry and exit flow of firms into the export market, despite having borne entry costs. Recent literature, e.g. Albornoz et al. (2012) and Nguyen (2012), has stressed that surviving exporters tend to experiment sequentially in the foreign market. However, to my knowledge, there has been little, if any, exploration on how these dynamics work within one destination, experimenting across products. Besides, my desire to focus on Peruvian firms in the USA market lies on the fact that the trade liberalisation process undertaken by both countries, which concluded with the enactment of a Free Trade Agreement in 2009, constitutes a recent event which has not been sufficiently addressed by the literature. Moreover, I count on a unique wide dataset of Peruvian exports at the firm-transaction level to all destinations, covering a long time period, and from which several research questions can be investigated.

In my first chapter, *Sequential Exporting Across Products, A Theory*, I develop a theoretical model, inspired by Albornoz et al. (2012), illustrating a sequential exporting strategy by firms across products in one destination in a two-period analysis, incorporating a scenario of trade liberalisation expressed as an unanticipated tariff elimination in period 2, and considering the role of production costs. My approach relies on the assumption that once the firm introduces a product into the market of interest, it gleans information about the market as a whole, and thus of export profitability of other products to that market. Three predictions emerge from this framework, establishing differences between firms with one-year experience in the market of interest, henceforth "new exporters", and more established firms. New exporters tend to grow more than experts both at the intensive margin (export growth in one product) and extensive margin (introduction of a new product) in the market of interest. However, new exporters are also more likely to stop exporting a product to that market right after début. Trade liberalisation boosts even more those intensive and extensive margin growths and reduces the probability of exit from the export business in that destination. The extensive margin growth and exit prevention are stronger for core competence products; whereas the intensive margin growth is larger for non-core competence products.

Those three predictions are empirically tested in my second chapter, *Sequential Exporting Across Products, Evidence from Peru*, using a rich dataset of Peruvian firms that exported to the United States between 2006 and 2013, analysing whether new Peruvian exporters to USA are more likely to intensify their participation in that market than more expert firms. In parallel, I analyse whether the tariff elimination from the USA-Peru Free Trade Agreement (FTA) in 2009 exacerbates this phenomenon; and whether these dynamics are more evident for core competence products. My empirical approach mostly lends support to my theory in the previous chapter, showing that Peruvian firms with one-year experience exporting a given product to USA grow more at the intensive and extensive margin than more experienced firms. However, they are also more prone to stop exporting a product to that market. Trade liberalisation is associated with a reduction of the exit probability for new exporters, as well as with an increase in the entry likelihood with a new product to USA for experienced exporters. The intensive margin growth of new exporters is even larger with a non-core competence product; but their extensive margin growth and exit prevention are larger with a core product; those effects being more evident for the smallest firms. One important issue to bear in mind when analysing the Peru-USA liberalisation process is that the financial crisis led to a sharp drop of Peruvian exports to USA in 2009, exactly when the FTA became effective. Indeed, Behrens et al. (2013) document the effects of that crisis for Belgian exports and imports, finding that negative changes at the firm-product-country level mostly occurred at the intensive margin. In this chapter, I disentangle both crisis and liberalisation effects by controlling for year fixed effects and the tariff change at the product level from 2008 to 2009.

In my last chapter, *Experimentation Speed Across Products, Evidence from Peru in the USA market*, I develop a theoretical model, based on Nguyen (2009) to explain how quickly exporters move on from one product to the other in a particular destination, in a setting where product demands follow a joint bivariate distribution. By exporting shipments of a first product A to market d and observing realised demand, the exporter gradually updates his perceived demand for product B. Expected profitability of product B, and thus the decision to export, is shown to be a function of the number of shipments of A, the correlation coefficient between the two demands, as well as the mean export value of A. Sequential exporting is predicted to take place faster (after fewer shipments of product A) if (i) trade costs of product B are lower, (ii) the mean value of A exports is larger, and (iii) the higher is the correlation between the two product demands in market d. This prediction is tested by a survival analysis, with the dataset described earlier, which contains daily data. The enactment of the USA-Peru FTA in 2009 is associated with an acceleration of the introduction of new products into the USA, expressed as either fewer shipments of previous products or a shorter time spell between the first shipments of the old and the new product. Such acceleration tends to be larger for products with higher pre-FTA tariffs that were not included in pre-FTA unilateral trade preferences by USA. Additionally, trade liberalisation tends to facilitate the introduction of new products by pre-FTA firms after having sent smaller values of previous products.

The remainder of the thesis is organised as follows. Firstly, Section 2 discusses the related literature. Then, subsequent sections each present a chapter. Section 3 presents *Sequential Exporting Across Products, A Theory.* Section 4 displays the empirical approach at *Sequential Exporting Across Products, Evidence from Peru.* Section 5 presents *Experimentation Speed Across Products, Evidence from Peru in the USA market.* Section 6 concludes.

2 Related Literature

Three large strands of the previous literature clearly nourish my research: (i) firm export dynamics, (ii) multi-product firms and (iii) experimentation.

2.1 Firm Export Dynamics

The growing literature on ***firm export dynamics*** has mainly focused on firm entry and exit, as well as the evolution of the intensive (within one market) and extensive margin (across markets). One of the first contributions is Roberts and Tybout (1997) who quantified the effect of prior exporting experience on manufacturing plants' decision to enter into foreign markets. They find that after a two-year absence, due to the depreciation of the export experience, re-entry costs are as similar as those of a new exporter. Moreover, larger and older plants are all more likely to export. Eaton et al. (2008) also for the Colombian case, observe that, while many firms start and stop exporting, export sales are dominated by a small number of very large and stable exporters.

Some studies address the Peruvian case, such as Freund and Pierola (2010), which shows considerable entry and exit flows of Peruvian exporters each year. However, in contrast to other studies, they argue that smaller firms can discover their entry costs through a very cheap trial, while firm size is positively associated with large export sales. In contrast, developing new products requires a much larger entry cost. Focusing on Peruvian agriculture, Malca and Rubio (2012) analyse the relation between tenure in export markets and export performance, finding that for one additional year a firm exports, there is a considerable rise in the probability of remaining as an exporter (survival).[1] In that line, working with Argentinean firms, Albornoz et al. (2016) investigate their survival in export markets, emphasising the role of market-specific sunk and fixed costs firms need to pay to operate abroad. They find that survival in an export market increases with firms' experience, theoretically represented by a rise in the ratio of sunk to fixed costs in a market.

The latter observation motivates me to refer to a growing tendency to the use of duration models to measure firms' probability to remain or exit from the export activity. Besedeš and Prusa (2006a), for instance, address the duration of USA imports from up to

[1]They classify firms by their mean annual exports, employing two categories: small (below US$ 50,000) and large (above or equal to US$ 50,000).

180 countries, finding a short median duration of about 2 or 4 years. They also obtain a negative duration dependence; that is, if a country can survive exporting for the first few years, its failure probability falls, maintaining its trade relation.

Other studies like Besedeš and Prusa (2006b) use more conventional survival analysis methods like the Kaplan-Meier estimator and the Cox proportional hazard models. These authors find that USA import trade relationships involving differentiated products, starting with considerably smaller initial purchases, have over twice as long a median duration as other product types. The larger these initial purchases, the longer the duration, and the larger the differences across product types. For the Peruvian case, Volpe Martincus and Carballo (2008) use both methods considering only new exporters, finding that both product and, especially, geographical diversification raise the chances of remaining an exporter. Larger firms, measured by number of employees, are more likely to survive in foreign markets. [2]

Despite the valuable findings from these studies, there is limited consideration of trade liberalisation into the analysis of export dynamics – Brenton et al. (2010), for instance, only introduces a dummy for countries signing a Regional Trade Agreement–, leaving room for further research.[3] Moreover, the cited papers on the Peruvian case have not addressed the recent enactment of the USA-Peru Free Trade agreement and other treaties. In that sense, this research represents an opportunity to bridge that gap, addressing the dynamics of exports in Peru, in a context of trade liberalisation.

Additionally, all studies on duration listed herein took the conventional process of considering the event of firms leaving the export market as the "failure" of interest. What about, instead, addressing a positive event of interest, for instance, how long it takes for firms to decide to enter into the export activity? In this thesis, I undertake a theoretical

[2] Many other studies analyse export survival by the aforementioned approaches, such as Besedes and Blyde (2010) for Latin America and Carrère and Strauss-Kahn (2014) for non-OECD countries. Others explore alternative methods like discrete-time models (Hess and Persson (2012)), or the Prentice and Gloeckler (1978) model (Brenton et al. (2010)).

[3] On the other hand, most of the recent works addressing trade liberalisation with firm-level data have been predominantly focused on its relation with firms' productivity. The common idea tested is that most productive firms will enter the export market and/or exporting makes firms more productive, and trade liberalisation plays the role of facilitating market access, especially for those more productive. Researches like Bustos (2011) on Argentina; Schor (2004) on Brazil; Pavcnik (2002) on Chile; Fernandes (2007) on Colombia; Amiti and Konings (2007) on Indonesia; Bernard and Jensen (1999) and Bernard and Jensen (2004) on the United States; De Loecker (2007) on Slovenia; Van Biesebroeck (2005) on Sub-Saharan African countries; and Lileeva and Trefler (2007) on Canada, go on that line.

approach and survival analysis to estimate how fast firms introduce a product into a market of interest, i.e. their *experimentation speed*.

Within the firm export dynamics strand of the literature, my research is closely related to the recently explored issue of ***sequential exporting***. In fact, the theoretical models in Chapters 3 and 5 and the empirical approach proposed in Chapter 4 are inspired in a previous research by Albornoz et al. (2012) for the Argentinean industry. These authors emphasise that many new exporters exit that business very shortly after entering, despite the existence of substantial entry costs; while others raise sales and expand to new destinations.

Their basic assumption is that a firm's export profitability is initially uncertain, and it will only be known once the firm enters the export market, paying a fixed entry cost. Such export profitability is perfectly correlated over time (persistent but ex-ante unknown demand patterns) and across destinations (similarities in either demand or supply conditions). The discovery of this profitability leads to a *sequential exporting* process, whereby firms use their initial export experience to infer information on their future success in a market and others.

Albornoz et al. (2012) derive three predictions on the export behaviour of new exporters as opposed to more experienced firms in the foreign market. After testing these predictions, the authors find that, despite entry sunk costs, many firms that start exporting drop out of the export business very shortly, while the successful ones grow at both intensive and extensive margin. Since breaking into a new market entails unrecoverable costs, and the information on export profitability has a global scope, these new exporters have an incentive to enter foreign destinations sequentially.

Their sequential exporting analysis is undertaken across markets; but I rather tackle the issue of how these firm export dynamics operate across products within one particular destination. Furthermore, the issue of trade liberalisation is not considered in this analysis. Indeed, Albornoz et al., 2012, (p. 30) argue that there is a gap in the literature to link *sequential exporting* with trade liberalisation processes:

> *"Another area where understanding firms' sequential exporting strategies can be far-reaching is trade policy. (. . .) the impact of trade agreements, at both the regional and the multilateral levels, could be much richer than what existing studies indicate. (. . .) this is an area that surely calls for further research".*

In light of this, the Peruvian case –with recent reforms in trade policy, especially the approval of the Free Trade Agreement with the United States in 2009, which effects on Peruvian firms' performance have not been sufficiently researched yet– represents an interesting scenario in which the aforementioned gaps can be bridged. Besides, Albornoz et al. (2012) obtains that, by realising their export profitability in one market, firms may sequentially decide to sell to further destinations in the next period. However, that is not a real time estimation, i.e. length of time elapsed between experimentation stages, either across markets and products within one destination. How fast do firms introduce a new product to a particular market? What factors determine the acceleration or delay of that decision? Does trade liberalisation play a role in this process?

2.2 Multi-Product Firms

Since the firm export dynamics analysis I develop in this thesis is across products in one destination, the existence of ***multi-product firms*** and the difference within firms between core and non-core competence products is an issue to be addressed.

Focusing on four African countries, Cadot et al. (2011) concludes that more diversified firms in terms of products, as well as in terms of markets, are more likely to succeed and survive in the export business beyond the first year.

But some other works give special emphasis to the issue of "core competence" products and its link with trade liberalisation, like Eckel and Neary (2010) who show that globalisation affects the scale and scope of multi-product firms through a competition and a demand effect. They assert that firms face a pressure to become "leaner and meaner", thereby raising their productivity and total output to serve foreign markets. Thus, firms are encouraged to focus on their "core competence" products, dismissing more marginal costly varieties. In that same line, Eckel et al. (2009) test the predictions of a theoretical model for the Mexican industry, arguing that there is a "cannibalisation effect", whereby an increase in the output of a "core competence" variety will reduce the sales of the others. The authors argue that this pattern takes place in response to trade liberalisation under the NAFTA treaty with Canada and USA, caused by an "intra-firm extensive margin" adjustment. Similar findings were obtained by Mayer et al. (2011) in the case of French exporters reacting to tougher competition.

Despite the links found between product specialisation and trade liberalisation, most of these works are limited to a single-year analysis at a firm level, rather than at a finer firm-product level. The rich dataset obtained for Peruvian firms, products exported and tariff rates over time provide a good chance to incorporate in Chapter 4 the difference between core and non-core competence products into an analysis on firm export dynamics across products, also accounting for the role of trade liberalisation. In Chapter 3, I strengthen my theory by exploring the difference between types of products.

There are other studies following the performance of *multi-product firms* in a longer period, such as Lacovone and Smarzynska Javorcik (2008), which presents stylised facts of firm-product dynamics in Mexican industry during an export boom. The authors find, among other facts, that new exporters tend to "start small" in value and number of products, and the introduction of new products is preceded by a surge in investment. Equally important, the intensive and extensive margin across products are positively correlated.

A valuable theoretical contribution is provided by Bernard et al. (2010), on the frequency, pervasiveness and determinants of product switching. The authors predict that the duration of a product in a firm's product mix is longer the greater the sale volume and the longer the tenure of the product; that the exit probability of a firm-product combination is decreasing in productivity and quality; and that the product adding and dropping rates are positively correlated. Motivated by that framework, Görg et al. (2012) analyses the determinants of products' survival in Hungarian firms' export mixes. Building on the idea that product choices are endogenous, they find that both firm and product characteristics matter in export dynamics. In fact, firm productivity, as well as product scale and tenure, is associated with higher export survival rates.

Another notable theoretical approach is found at Bernard et al. (2006), which incorporates the role of trade liberalisation. Here, firm productivity is a combination of firm-level "ability" and firm-product-level "expertise", both unknown until the firm pays a sunk cost of entry. The authors conclude that higher "ability" raises a firm's productivity across all products, inducing a positive correlation between intensive and extensive margins. Trade liberalisation fosters productivity growth within and across firms and in aggregate, because firms drop marginally productive products and the least productive firms exit. However, surviving firms increase their share of products sold abroad, as well as their exports per product. Arkolakis and Muendler (2010) conducts an empirical test with cross sectional Brazilian data, obtaining results akin to the predictions from Bernard et al. (2006). In an update from their previous work, Arkolakis et al. (2015) present a general-equilibrium model of multi-product firms, also tested with Brazilian data, which most relevant characteristic is that additional products further from a firm's core competency incur higher costs, but face lower market access costs, unlike other multi-product firms models where market access costs are fixed or constant for additional products.

These works, more focused on the firm-product level, offer a valuable contribution on the determinants of products' survival in firms' export mix and their export scope in a market. However, in Chapter 5 I evaluate a different phenomenon. What determines firms' decision to introduce a product or set of products into one particular destination, and how long does it take for this event to occur? In other words, I am interested in measuring firms' experimentation speed in a market. And one departure point to consider comes from a literature survey by Bernard et al. (2011), highlighting studies which find that firms update their priors about profitability in export markets, based upon sales, deciding to exit or expand their penetration of export markets over time.

2.3 Experimentation

The point raised earlier leads me to refer to the literature on ***experimentation***, dating back to a first model by Wald (1945b), illustrating sequential tests of statistical hypotheses. In this process, one can decide either to fail to reject a null hypothesis, reject it, or continue the experiment by making an additional observation. That process terminates when one of the first two decisions is made; but will continue if we opt for the third. Thus, a sequential test is undertaken, where the number of observations is a random variable, unlike other tests where that number is predetermined. The author argues this test is more efficient as the expected number of observations required is lower.[4] Moscarini et al. (1998) extend this approach, aiming to find an optimal experimentation level, assuming the decision maker is impatient, making variable-size experiments each period, at some increasing and strictly convex cost before making a final decision. That optimal level is increasing in the confidence about the project outcome and for more impatient agents.

These basic ideas were further deployed in contexts like the decision to adopt new agricultural technologies in Ghana (Conley and Udry (2001)) and India (Foster and Rosenzweig (1995)) or the modelling of entrepreneurial learning (Minniti and Bygrave (2001)). The first two focus on belief updates depending on neighbours' performance.[5] Other studies, like Kelly and Kolstad (1999) on growth and pollution, emphasise that

[4] Wald (1945a) provides more practical examples of this test.

[5] Bolton and Harris (1999) provides a theoretical approach in which N decision makers learn from each other's experimentations, deciding between a "safe" and a "risky" action.

decision makers do a Bayesian learning process. This theoretical approach addresses the relation between greenhouse gas levels and global mean temperature changes. Policy makers learn depending on stochastic shocks to the realised temperature, and the expected learning time is related to the variance of that shock and the emissions policy, implying a tradeoff between emissions control and learning speed.

Closer to my focus are Rauch and Watson (2003) and Watson (1999) on "starting small" in a trade partnership. The former, theoretically portraying the relation between a developed country buyer and a developing country supplier, states that matched firms "start small" to assess the supplier's ability to successfully fulfil a large order. That propensity rises with the cost of seeking a new supplier, and falls with the probability of fulfilling a large order after training. The latter incorporates renegotiation into the analysis, making both agents decide with incomplete information whether to cooperate or betray each other. They find an equilibrium where partners "start small", uniquely selected under a strong renegotiation condition.

A recent contribution in that sense is provided by Araujo et al. (2016), with a theoretical approach whereby a producer searches for a distributor in a foreign market to sell its products abroad, in an environment with incomplete information. Some distributors are prompted to default a contract; whereas others are incentivised to abide by their contractual obligations, thereby building private reputations. As a result, their model, expirically tested for Belgian exporters, predicts that exporters start with higher volumes and sell for longer periods in countries with better contracting institutions, and when they have prior foreign experience. However, that institutional quality is found to deter the export growth of firms, conditional on survival.

Also into the exports matter is Fernandes and Tang (2014) on how learning from neighbouring firms affects new exporters' performance, updating their prior belief on a foreign market demand, based on the number of exporting neighbours, export heterogeneity and the firm's own belief. A positive signal from neighbours increases the firm's probability to enter a market and its initial sales, and that effect is stronger the more exporting neighbours and the less familiar to the market the firm is.

Another approach is in terms of number of destinations explored. Akhmetova and Mitaritonna (2012) propose an experimentation model whereby a firm can postpone full entry into a market and learn more about its products' demand by accessing a few consumers. The firm chooses an optimal experimentation intensity (number of consumers accessed) and an entry/exit policy. That intensity will be larger if the firm is more productive, even if its beliefs are low. Empirically, these predictions are proven in a context of testing destinations before fully entering into a region.

But the closest work to my interest is Nguyen (2012), explaining why firms wait to export and why many fail. Its key assumption is imperfect correlation of demand across destinations, so that firms can use previously realised demands from other markets to forecast demands from untested destinations. This gives firms the chance to delay exporting to one market, by gathering information from already explored destinations. Thus, firms opt for a sequential strategy, entering and exiting destinations after realising their demands. A similar rationale I propose to apply in Chapter 5 to explain firms' experimentation strategy within one market, by introducing new products sequentially. I theoretically measure how long it takes for a firm, after selling one new product to the market of interest, to sell another one, expressed as the number of shipments of the first product prior to the first shipment of the next one. Thus, I aim to measure firms' experimentation speed in a market and its determinants, highlighting the role of trade liberalisation. Nguyen (2012) does not consider the influence of other firms. I follow this feature in my approach, as I am more interested in the transition from the first to subsequent new products, rather than the decision to export for the first time.

3 Sequential Exporting Across Products: A Theory

3.1 Introduction

A growing literature has recently contributed to gain theoretical insights on the firms' decisions to enter and exit from the export activity, along with the determinants of those decisions. Melitz (2003) was one of the first contributions, theoretically showing that exposure to trade makes the most productive firms enter the export market after paying an entry cost, while the least productive opt for exiting and focusing on the domestic market. Another study by Roberts and Tybout (1997) proposes that, apart from sunk entry costs, firms' prior export experience is determinant in their current export status.

Nevertheless, export entry costs and/or productivity cutoffs might differ across destinations and products. Hence, firms might be persuaded to experiment in the export activity sequentially, realising their demand and profitability. In that line, Albornoz et al. (2012) presents a valuable theoretical approach illustrating how firms learn about their export profitability, initially uncertain, by sequentially entering different markets, after paying a sunk entry cost. Such export profitability is assumed to be perfectly correlated over time and across destinations, implying that firms, by using their first export experience in a market, can infer their future success in other markets. Albornoz et al. (2012) derive three predictions from that framework on firms' export behaviour, establishing differences between new and more experienced exporters. In summary, the model predicts that, despite entry costs, firms that start exporting drop out of the business very quickly; but those which survive tend to grow more than more expert firms both at the intensive (export growth in a market) and extensive margin (entry into a new market).

Sequential exporting analysis is thus undertaken across destinations; but how do these export dynamics operate across products within one destination? Moreover, another important issue is how changes in the trade policy of the market of interest, e.g. trade liberalisation, affect these dynamics.

Few other studies provide theoretical contributions on export dynamics at the firm-product level. Bernard et al. (2010) presents an approach addressing the frequency, pervasiveness and determinants of product switching. From that model, the duration of a product in a firm's export basket is longer the greater the greater the sale volume and the tenure of the product. The approach also predicts that the exit probability of a firm-product combination is decreasing in product and quality, and that product adding and dropping rates are positively correlated.

Another valuable contribution is given by Bernard et al. (2006). The authors predict that firm-level "ability" raises a firm's productivity across products, inducing a positive correlation between intensive and extensive margins. Trade liberalisation makes a firm drop its marginally productive goods from its mix; while the least productive firms exit; but those surviving raise their share of products sold abroad and sales per product.

These two papers provide important insights on the survival of products in a firm's portfolio; but not precisely on the survival of a firm-product combination in a destination. Also, the survival probability of a firm in an export market with a product may also depend on its experience and ability to realise its products' profitability in that destination, as well as firm-product-specific characteristics, such as the "core competence" condition of that product.

Given the gaps described, this chapter contributes to the literature by providing a theoretical model, inspired by Albornoz et al. (2012), which reorients the sequential exporting analysis, focusing on the dynamics new exporters undergo in terms of product diversification within one market, incorporating trade liberalisation into that analysis, in the shape of a tariff elimination by the destination country on the products exported by a trading partner, and distinguishing between better performing (core competence) products and worse performing ones.

My model is a two-period analysis in which firms from an origin country decide whether or not to export to a destination country, depending on their expected export profitability, assumed to be perfectly correlated across products and over time. Overall, my model predicts that new exporters starting in $t = 1$, conditional on survival, tend to grow more in a market than more consolidated firms in $t = 2$ at both the intensive (export growth with a product) and extensive margin (experimentation with a new product). However, those new exporters are also more likely to stop selling a product in that market. Trade liberalisation contributes to exacerbate the intensive margin growth and to reduce the exit probability for newcomers, as well as boosting the extensive margin growth for the experts. Also, the exit prevention and probability to experiment with a new product is larger for a "core competence" product.

The remainder of this chapter is organised as follows. Section 3.2 outlines the basics of the model. Section 3.3 details how firms construct their export decision (how much to sell of each product). Section 3.4 addresses the firms' entry decision into the destination. Section 3.5 explains the predictions from the model. Section 3.6 addresses how these predictions change if I assume imperfect correlation of the export profitability across products. Section 3.7 concludes.

3.2 The Model

Consider one economic environment where firms can export goods from a country of origin, o, to a destination country, d, over two periods $t = 1, 2$.

A risk-neutral producer from country o evaluates whether to export or not to country d. His product portfolio consists of two products A and B. If the firm decides to enter d, it will have to pay a sunk entry cost F_d for any product it exports, assumed to the identical across products. This assumption differs from studies like Arkolakis et al. (2015), which allows the entry costs per product to vary depending on the firm's product scope. These sunk entry costs are hypothesised to reflect distribution channels, marketing strategy and exporting procedures, which might be specific to each kind of product. I assume other entry costs that are common across products within a market, such as information on institutional and policy characteristics of the foreign country, to be minimal and/or easily accessible to firms.

In order to export products A and B to country d, firms must pay a product-specific unit trade cost (tariff levied by d) τ^A and τ^B, such that $\tau^A \leq \tau^B$.[6] The variable costs firms have to incur for each product comprise a unit export cost, c_x^A and c_x^B, and a firm-specific unit production cost, c_p^A and c_p^B, such that $c_p^A > c_p^B$, which means that a firm is more efficient producing good B than good A. This implies that good B is the firm's core competence product; the good in which the firm is more productive. While the production costs are known to the firm, the unit export costs are unknown. It is true that this cost characterisation is one particular case, and other scenarios may take place. However, as I will further explain afterwards, I am particularly interested in the case where, despite having a "core competence" product, the firm opts for experimenting first with the "non-core" product, cheaper to export in a scenario without trade liberalisation, and how that decision changes when trade costs are eliminated. This assumption is not essential for the development and final predictions of my model. Indeed, a more straightforward scenario may consist of product A being both the core competence and the one with the lowest trade cost, and the features of my predictions will remain unchanged, as will be seen

[6] I make the assumption that home firm pays the tariff, since I do not have information on importers.

afterwards. The major difference lies on which product is exported first before and after trade liberalisation.

The demand side, on the other hand, is represented by the following function:

$$q^j(p^j) = d^j - p^j, \tag{3.1}$$

where q^j denotes the quantity of product A or B exported; p^j is the price of that product; and d^j is an unknown demand component. In other words, uncertainty can be found in both the supply and demand sides. The calculation of firms' export profitability for product $j = \{A, B\}$, denoted as μ^j, will then consider the unknown demand component and the unknown unit export cost, as well as the known unit production cost:

$$\mu^j \equiv d^j - c_x^j - c_p^j. \tag{3.2}$$

The unknown components of that export profitability of product j in destination d, $d^j - c_x^j$, can be summarised by the term μ^{Nj}, which is the uncertain variable of interest in the model. Hence, when it comes to determine the optimal quantity of product j exported to d in each time period, firms will have to maximise profits –revenues minus costs–, expressed by:

$$\pi^j = (\mu^{Nj} - c_p^j - \tau^j - q^j)q^j. \tag{3.3}$$

The central assumption of this model is that the unknown export profitabilities of products sold in destination d are perfectly correlated, implying that they are constant over time and common across products. [7] In other words, μ^{Nj} is constant at $t = 1, 2$, and $\mu^{NA} = \mu^{NB} = \mu^N$.

The model also assumes that the uncertain export profitability μ^N is a random variable with a cumulative distribution function $G(.)$, ranging within the interval $[\underline{\mu^N}, \overline{\mu^N}]$.

[7] Correlation over time can be related to *ex ante* unknown demand patterns in the target market or unknown idiosyncratic export costs, which are stable over time.Albornoz et al. (2012) mention, as examples of these export costs, shipping and port activities, distribution of goods in foreign markets, export finance and insurance, among others. Similarly, correlation across products may arise from similarities in either supply or demand conditions across products exported to a particular destination. Regarding this last point, most of the firms considered in the sample are focused in one industry, exporting goods with similar supply and demand patterns. Hence, I consider the assumption of correlation across products as appropriate.

Consider an initial scenario where $\tau^A + c_p^A \leq \tau^B + c_p^B$, meaning that it is still cheaper for the firm to produce and export product A. Subsequently, I incorporate the event of trade liberalisation by destination d, expressed as $\tau^A = \tau^B = 0$. Thus, after that event, the firm finds that it is less costly to export product B, since $c_p^A > c_p^B$. In that sense, this model aims to illustrate the firm's export decisions over time, depending on the presence or absence of trade costs, and considering the firm's own efficiency across products. In other words, the potential existence of a tradeoff between core competences (expressed in low production costs) and trade costs (expressed in high tariffs).

3.3 The Firm's Export Decision

I make an exercise of a firm evaluating profits from exporting to destination d, *ex ante* at $t = 0$. Like Albornoz et al. (2012), I assume that firms do not discount future profits.

Initially, I analyse the firm's behaviour at $t = 1, 2$, in a scenario without trade liberalisation. I illustrate what decision the firm makes in each period, and the conditions firms take into account in their decision-making process. Henceforth, I denote as e_t^j the firm's decision to export product j to destination d at time t, taking value 1 if the firm actually exports, and 0 otherwise. The firm *ex ante* decides from the following set of options: i) *no entry* to destination d; ii) *simultaneous entry*, exporting both products A and B; or iii) *sequential entry*, exporting first the cheaper product A in $t = 1$, then selling both A and B in $t = 2$. It may also be possible, as will be seen afterwards, that the firm decides to remain exporting product A in $t = 2$ or dropping that product from market d in that period, after selling it in $t = 1$.

3.3.1 The Firm's Export Decision at t=2

In case the firm decides ***not to enter*** to market d, it will not discover the uncertain export profitability. Hence, in effective terms, $\mu^N = 0$.

In the ***simultaneous entry*** option, the firm will have already realised the export profitability μ^N, and will choose $\hat{q}_2^j$, its optimal export value for product $j = A, B$ in $t = 2$ by maximising the profit function in Equation 3.3, provided that the realised μ^N is greater than product j's unit costs:

$$\hat{q}_2^j = 1_{[\mu^N > \tau^j + c_p^j]} \left(\frac{\mu^N - c_p^j - \tau^j}{2} \right). \tag{3.4}$$

Substituting this optimal output into Equation 3.3, the maximised profit from j in $t=2$ is:

$$\hat{\pi}_2^j = \left(\frac{\mu^N - c_p^j - \tau^j}{2}\right)^2. \tag{3.5}$$

If, in contrast, the realised export profitability does not exceed the known costs ($\mu^N \leq \tau^j + c^{pj}$), q_2^j will be zero.

Since I am interested in obtaining the expected value in $t = 0$ of those maximised profits in $t = 2$, and given the assumed distribution of export profitabilities, I construct the following expression, representing the value of continuing to export product j in $t = 2$ after $\mu^N > \tau^j + c_p^j$ is discovered:

$$V(\tau^j; c_p^j) = \int_{\tau^j + c_p^j}^{\overline{\mu^N}} \left(\frac{\mu^N - c_p^j - \tau^j}{2}\right)^2 \mathrm{d}G(\mu^N); j = A, B. \tag{3.6}$$

If the firm opts for ***sequential entry***, it will have inferred μ^N after exporting product A in $t = 1$. Hence, the export value of that product in $t = 2$, q_2^A is given similarly to Equation 3.4, leading to an expected value of profits in $t = 2$, denoted as $V(\tau^A; c_p^A)$, like in Equation 3.6.

As for product B, the firm will export it in $t = 2$ if the maximised profits are larger than the destination's sunk cost F_d:

$$\left(\frac{\mu^N - c_p^B - \tau^B}{2}\right)^2 \geq F_d. \tag{3.7}$$

Rearranging Equation 3.7, the firm will export B in $t = 2$ $-e_2^B(\tau^B; c_p^B) = 1-$ if $\mu^N \geq 2F_d^{1/2} + \tau^B + c_p^B$. From that inequality, I can obtain a value $F_{d2}^B(\tau^B; c^{pB})$ for which Equation 3.7 becomes an equality. Thus, I can conclude that $e_2^B(\tau^B; c_p^B) = 1$ if $F_d \leq F_{d2}^B(\tau^B; c_p^B)$. It can be inferred that F_{d2}^B is strictly decreasing in the known costs τ^B and c_p^B.

Since $e_2^B = 1$, this implies that $\mu^N > \tau^B + c_p^B$. Hence, the firm will decide its export value of product B to d in $t = 2$ in the same way as it did for product A. Hence, $\hat{q}_2^B = \left(\frac{\mu^N - c_p^B - \tau^B}{2}\right)$.

With the output and profits obtained, I am now able to define the expected value in $t = 0$ of the firm's decision to export B to destination d in $t = 2$:

$$\begin{aligned} W(\tau^B; c_p^B; F_d) \equiv& \int_{2F_d^{1/2}+\tau^B+c_p^B}^{\overline{\mu^N}} \left[\left(\frac{\mu^N - c_p^B - \tau^B}{2} \right)^2 - F_d \right] \mathrm{d}G(\mu^N) \\ =& \{V(\tau^B; c_p^B) - \int_{\tau^B+c_p^B}^{2F_d^{1/2}+\tau^B+c_p^B} \left(\frac{\mu^N - c_p^B - \tau^B}{2} \right)^2 \mathrm{d}G(\mu^N)\} \\ &- F_d[1 - G(2F^{1/2} + \tau^B + c_p^B)]. \end{aligned} \tag{3.8}$$

The term in the left hand side of Equation 3.8, $W(\tau^B; c_p^B; F_d)$, represents the expected value of exporting product B to d after realising μ^N by previously exporting product A. The term in curly brackets accounts for the *ex ante* expected gross profit from exporting B in $t = 2$; whereas the last line of the equation stands for the fixed entry cost incurred to export B, multiplied by the probability that exporting such product is worthwhile.

Recall that my theoretical approach assumes the sunk entry cost per product F_d identical across products. It is appropriate to assess the effect on the firm's export decision in $t = 2$ in a *sequential entry* strategy if I followed Arkolakis et al. (2015), allowing the product entry cost to differ, depending on the exporter's product scope. In their approach, these authors argue that a firm's incremental market access cost may increase or decrease with exporter product scope. That alternative scenario would not affect the maths of my *ex ante* export decision process; but the larger or smaller entry cost for product B after realising the export profitability by selling product A should be compared with the cutoff value $F_{d2}^B(\tau^B; c^{pB})$ derived from Equation 3.7 to determine if it is profitable enough to introduce product B in $t = 2$. A variable F_d for product B will also affect the expected value $W(\tau^B; c_p^B; F_d)$ derived from Equation 3.8, increasing or reducing the total expected value of the firm's sequential entry strategy.

3.3.2 The Firm's Export Decision at t=1

Like in the second period, if the firm opts for ***not entering*** destination d in $t = 1$, it will not be able to realise the uncertain export profitability; namely, $\mu^N = 0$.

If the firm undertakes a ***simultaneous entry*** strategy, it chooses the optimal export values q_1^A and q_1^B to maximise its total gross profits for the two periods, expressed by:

$$
\begin{aligned}
\psi(q_1^A, q_1^B; \tau^A, \tau^B; c_p^A, c_p^B) \equiv & \int_{\underline{\mu^N}}^{\overline{\mu^N}} (\mu^N - \tau^A - c_p^A - q_1^A) q_1^A \mathrm{d}G(\mu^N) \\
& + \int_{\underline{\mu^N}}^{\overline{\mu^N}} (\mu^N - \tau^B - c_p^B - q_1^B) q_1^B \mathrm{d}G(\mu^N) \\
& + max\{1_{\{q_1^A > 0\}}, 1_{\{q_1^B > 0\}}\}[V(\tau^A; c_p^A) + V(\tau^B; c_p^B)].
\end{aligned} \tag{3.9}
$$

The first two terms on the right hand side of the equation correspond to the expected gross profits of the firm in $t = 1$; while the third term represents the expected gross profits in $t = 2$, given that the firm exported either product A or B in the previous period. This latter term accounts for the idea that exporting one product to a destination reveals information about the firm's profitability in both products.

By maximising Equation 3.9, the firm obtains the optimal export values for each product in $t = 1$, now taking into account the expected value of the uncertain export profitability, $E\mu^N$. Thus, the optimal exports are:

$$
\hat{q}_1^A(\tau^A; c_p^A) = 1_{\{E\mu^N > \tau^A + c_p^A\}} \left(\frac{E\mu^N - \tau^A - c_p^A}{2} \right) + 1_{\{E\mu^N \leq \tau^A + c_p^A\}} \varepsilon. \tag{3.10}
$$

$$
\hat{q}_1^B(\tau^B; c_p^B) = 1_{\{E\mu^N > \tau^B + c_p^B\}} \left(\frac{E\mu^N - \tau^B - c_p^B}{2} \right). \tag{3.11}
$$

Equation 3.10 shows that it is possible for the firm to decide to export A in $t = 1$ even if $E\mu^N < \tau^A + c_p^A$, selling an arbitrarily small value ε, representing a case of experimentation in d with product A. The benefit of this decision is the discovery of the unknown μ^N. If such discovered profitability is greater than the known costs, the firm will remain exporting that good in the subsequent periods. In this model, the firm can adopt that strategy for product A exclusively, since $\tau^A + c_p^A \leq \tau^B + c_p^B$ and $\mu^{NA} = \mu^{NB}$. The decision for product B is more restrictive, as the firm will export that product to d in $t = 1$ if the expected export profitability exceeds the unit trade and production costs of B.

In the case of exporting ε of A in $t = 1$, I obtain a positive value for the limit of the expected gross profits from the *simultaneous entry* strategy:

$$
\lim_{\varepsilon \to 0} \psi(\varepsilon, 0; \tau^A, \tau^B; c_p^A, c_p^B) \equiv V(\tau^A; c_p^A) + V(\tau^B; c_p^B) > 0, \tag{3.12}
$$

which is clearly greater than the option of not exporting at all in $t = 1$, since the firm would not be able to benefit from realising the export profitability, represented by the future profits from exports in $t = 2$.

If, conversely, the firm expects the unknown export profitability to be greater than the known costs of products A and B, respectively, this will be its expected gross profits from entering destination d with each product j:

$$\psi^j(\tau^j; c_p^j) \equiv 1_{\{E\mu^N > \tau^j + c_p^j\}} \left(\frac{E\mu^N - \tau^j - c_p^j}{2} \right)^2 + V(\tau^j; c_p^j) > 0. \tag{3.13}$$

Thus, considering Equations 3.12 and 3.13, and the optimal export values from Equations 3.10 and 3.11, I can attain the firm's expected gross profits from the *simultanoeus entry* strategy, at optimal output levels:

$$\begin{aligned} \psi^{Sm}(\tau^A, \tau^B; c_p^A, c_p^B) &\equiv \lim_{\varepsilon \to 0^+} \psi^{Sm}(\hat{q}_1^A(\tau^A; c_p^A), \hat{q}_1^B(\tau^B; c_p^B); \tau^A, \tau^B; c_p^A, c_p^B) \\ &= \psi^A(\tau^A; c_p^A) + \psi^B(\tau^B; c_p^B). \end{aligned} \tag{3.14}$$

If the firm, on the contrary, opts for a ***sequential entry*** strategy, at $t = 1$ the firm will enter destination d with product A for being less costly. Hence, it will choose q_1^A to maximise its gross profits:

$$\begin{aligned} \psi^{Sq}(q_1^A; \tau^A, \tau^B; c_p^A, c_p^B) \equiv &\int_{\underline{\mu^N}}^{\overline{\mu^N}} (\mu^N - \tau^A - c_p^A - q_1^A) q_1^A \mathrm{d}G(\mu^N) \\ &+ 1_{\{q_1^A > 0\}} [V(\tau^A; c_p^A) + W(\tau^B; c_p^B; F_d)]. \end{aligned} \tag{3.15}$$

The expression above emphasises that the firm learns its export profitability in destination d only if it decides to export A ($q_1^A > 0$). Then, by choosing its optimal level of output for product A, $\hat{q}_1^A(\tau^A; c^{pA})$, Equation 3.15 converges to the following expression for the expected gross profits from the firm's *sequential entry* strategy:

$$\begin{aligned} \psi^{Sq}(q_1^A; \tau^A, \tau^B; c_p^A, c_p^B) &\equiv \lim_{\varepsilon \to 0^+} \psi^{Sq}(\hat{q}_1^A(\tau^A; c_p^A); \tau^A, \tau^B; c_p^A, c_p^B) \\ &= \psi^A(\tau^A; c_p^A) + W(\tau^B; c_p^B; F_d), \end{aligned} \tag{3.16}$$

which reflects the firm's possibility to enter destination d with product A first, even if its initial expectations are pessimistic: $E\mu^N < \tau^A + c_p^A$. This occurs because, by exporting the arbitrarily small value ε in $t = 1$, the firm does not only get informed of its success in product A, making it export more of such product in $t = 2$; but it also gets informed of its potential success in product B, making it jump into that business in $t = 2$, since profitabilities in both products are perfectly correlated.

3.4 The Firm's Entry Decision

When defining the export strategy followed by firm i in destination d, I focused on the expected gross profits, ψ^{Sm} and ψ^{Sq}, from *simultaneous* and *sequential exporting*, respectively. However, in order to determine which of these entry strategies to undertake, the firm will have to consider the net profits from each of those options. Such net profits are functions of these expected values and the product-specific sunk entry costs F_d. From the derivation of net profits, I can obtain some cutoff values of F_d which determine whether it is optimal to adopt a sequential or simultaneous entry strategy, or no entry at all to destination d.

From Equation 3.14, I can obtain the firm's net profit from the *simultaneous entry* strategy, expressed as π^{Sm}:

$$\pi^{Sm} = \psi^{A}(\tau^{A}; c_p^{A}) + \psi^{B}(\tau^{B}; c_p^{B}) - 2F_d, \tag{3.17}$$

which shows that, from the gross profit, the firm has to discount the sunk entry cost for each product, assumed to be identical across them.

Similarly, from Equation 3.16, I attain the firm's net profit from the *sequential entry* strategy, expressed as π^{Sq}:

$$\pi^{Sq} = \psi^{A}(\tau^{A}; c_p^{A}) + W(\tau^{B}; c_p^{B}; F_d) - F_d. \tag{3.18}$$

It can be concluded that *simultaneous entry* into destination d with products A and B will be optimal if $\pi^{Sm} > \pi^{Sq}$ and $\pi^{Sm} \geq 0$. Conversely, *sequential entry*, by exporting product A in $t = 1$ and both products in $t = 2$ will be optimal if $\pi^{Sq} > \pi^{Sm}$ and $\pi^{Sq} \geq 0$. If neither of these conditions is met, the firm does not enter destination d with any product.

Therefore, from Equations 3.17 and 3.18, I can argue that *simultaneous entry* is optimal if $F_d < \psi^{B}(\tau^{B}; c_p^{B}) - W(\tau^{B}; c_p^{B}; F_d)$ and $F_d \leq \frac{[\psi^{A}(\tau^{A}; c_p^{A}) + \psi^{B}(\tau^{B}; c_p^{B})]}{2}$. Comparing these two expressions, it can be stated that the right hand side of the second condition is necessarily greater than the right hand side of the first one, since $W(\tau^{B}; c_p^{B}; F_d) > 0$ and $\psi^{B}(\tau^{B}; c_p^{B})$ is strictly decreasing in τ^{B} and c_p^{B}, also considering that $\tau^{A} + c_p^{A} \leq \tau^{B} + c_p^{B}$. Meeting these criteria encourages to prefer *simultaneous* to *sequential entry.* Moreover, if the sunk entry cost F_d is small enough, the firm will even prefer *simultaneous entry* to no entry to destination d at all.

Thus, firm i's entry strategy into destination d at $t = 1$ can be summarised as follows:

a) *simultaneous entry* is optimal if: $F_d < \psi^B(\tau^B; c_p^B) - W(\tau^B; c_p^B; F_d)$,

b) *sequential entry* is optimal if: $\psi^B(\tau^B; c_p^B) - W(\tau^B; c_p^B; F_d) \leq F_d \leq \psi^A(\tau^A; c_p^A) + W(\tau^B; c_p^B; F_d)$,

which implies that the firm will export product A to destination d in $t = 1$ if either condition a) or b) is satisfied. On the other hand, it will export B in $t = 1$ only if condition a) is met. These implications can be expressed as:

1. $e_1^A(\tau^A, \tau^B; c_p^A, c_p^B) = 1 \leftrightarrow F_d \leq \psi^A(\tau^A; c_p^A) + W(\tau^B; c_p^B; F_d)$.
2. $e_1^B(\tau^B; c_p^B) = 1 \leftrightarrow F_d < \psi^B(\tau^B; c_p^B) - W(\tau^B; c_p^B; F_d)$.

In other words, *simultaneous entry* into d takes place if the sunk entry cost per product F_d is sufficiently small. The higher this cost is, the better it is to postpone the export of the more costly product B.

Hence, similar to Albornoz et al. (2012) entry export strategy across markets, I find that there are thresholds of the sunk entry cost whereby firms determine their entry export strategy across products within one market. There is a threshold value F_d^{Sm} at which the firm is indifferent between *simultaneous* and *sequential entry*; and another threshold F_d^{Sq}, at which it is indifferent between *sequential entry* and *no entry* into destination d at all.

These results can be summarised in the following proposition:

Proposition 1: *There are threshold values for F_d, such that $F_d^{Sq} > F_d^{Sm} \geq 0$. At $t = 1$, the firm exports both products to d if $F_d \leq F_d^{Sm}$; only product A if $F_d^{Sm} < F_d \leq F_d^{Sq}$; and no product if $F_d > F_d^{Sq}$. The smaller F_d^{Sm} threshold is positive only if $E\mu^N > \tau^B + c_p^B$. Finally, when $F_d^{Sm} \leq F_d \leq F_d^{Sq}$, the firm will export product B in $t = 2$ if it previously realises in $t = 1$ that $\mu^N \geq 2F_d^{1/2} + \tau^B + c_p^B$.*

3.5 Predictions from the Model

The model described generates several implications regarding the dynamics of exporters' behaviour in a particular market. Specifically, there is a difference between firms that are new to a particular destination, and more consolidated exporters in that market, in terms of the export growth of a good –*intensive margin*–, the decision to export a new product –*extensive margin*–, and the decision to stop exporting a product to that destination –*exit*–. Here I detail the three main predictions derived from the theoretical model. Each prediction is presented under the scenarios with and without trade liberalisation, expressed as an unanticipated elimination of tariffs τ^j, in $t = 2$, by country d on products from country o, in order to see how the export dynamics change from one case to the other.[8]

Prediction 1 – Intensive Margin: *Conditional on survival, firms tend to experience a faster export growth in destination d in $t = 2$, once after they began exporting their first products there in $t = 1$. Trade liberalisation exacerbates this growth, which will be larger the higher the initial tariff and the production costs are.*

This implies that exporters raise the sales of their products to a country to a larger extent when they are new to that market; namely, when they learn their export profitabilities in that destination.[9] Once the uncertainty is resolved, there is no reason for further export growth in the future for those products.[10] Also, since exporting those first products convey all information about a destination, we should not expect export growth for subsequent products exported. Such null export growth is also expected for more experienced firms that discovered their export profitabilities further in the past.

When *trade liberalisation* occurs, expressed as a tariff elimination by destination d in $t = 2$, such export growth is boosted, especially for those products with higher initial tariffs and/or production costs.[11] Moreover, after the event of liberalisation, the export growth for first products will be greater for those goods with larger known production costs; namely, those at which firms are not so efficient –non-core competence products–. This occurs because firms, when experimenting with a non-core product, realise that country d's demand for their product –export profitability– is greater than these high costs, which prompts them to attempt to profit more from that demand by shipping more of that product and/or charging a higher price, leading to larger sales and revenues one period later. Hence, they are motivated to explore their potential with that product. Additionally, even though expert firms also grow at the intensive margin when tariffs are eliminated, the effect of trade liberalisation is greater for the less experienced firms in d.

[8] Appendix A.1 provides a full proof for each of these predictions.

[9] See Equations A.2 and A.3

[10] See Equation A.6

[11] See Equations A.9 and A.10

Prediction 2 – Extensive Margin: *Conditional on survival, firms that started exporting to destination d in* $t = 1$ *are more likely to export a new product to that market in* $t = 2$ *than more experienced firms. That experimentation likelihood is higher for less costly products. Trade liberalisation increases even more that likelihood, but that increment is larger for the experts.*

Once a firm starts exporting to a destination, and having discovered its profitability, conditional on survival, it is very likely to explore more that market by exporting new products in the next period. Conversely, more expert firms in d have already learnt enough about that market, and are less likely to make that decision, which has probably been done in the past.[12]

When *trade liberalisation* occurs, there is an increase in the probability of new exporters experimenting with new products in d in the future, regardless of how costly it is to produce a particular good. However, that increase in the entry probability is larger for expert firms, which without liberalisation had zero entry likelihood.[13] Besides, exporters are more likely to experiment in the next period with a less costly product, belonging to its core competences, especially after the event of liberalisation.

If I allowed, like Arkolakis et al. (2015), the sunk entry cost F_d to differ across products, that would affect the new exporter's probability of introducing product B in $t = 2$, after having sold the cheaper product A in $t = 1$. If the incremental market access cost decreases with product scope, as Arkolakis et al. (2015) empirically find, then the entry probability will rise even more for new exporters. As for the experts, which presumably have already sold their "core competence" products to d in the past, it is reasonable to claim that a declining F_d with scope may also raise their likelihood to introduce a new product, but that would depend on the width of their product scopes, since products lying further from their core competencies bear lower entry costs but higher production costs.

Prediction 3 – Exit: *Firms that exported their first products to destination d in* $t = 1$ *are more likely to stop exporting those goods in* $t = 2$ *than more expert firms in that market. Such likelihood is larger for more costly products; and trade liberalisation diminishes that probability.*

Since more expert firms are more aware of the export profitability in destination d than newcomers, the latter are more likely to discover that it is not worth exporting a

[12]See Equation A.13

[13]See Appendix A.1.2

particular product to that market, leading to stop exporting that product to d, right after entering that market.[14]

Once *trade liberalisation* takes place, that higher exit likelihood for new exporters decreases, regardless of the product they export. However, the exit probability is generally greater for more costly products, not belonging to firms' core competences, especially after the event of liberalisation.[15]

It is appropriate to remind that these three predictions are robust to alternative basics of my model regarding trade and production costs of products A and B. Thus, if my model stated that product A was the "core competence" product and the good with the lowest tariff, it would be that product the most likely to be introduced in *Prediction 2* and the least likely to be dropped from market d in *Prediction 3.* By contrast, product B, the "non-core" product in this alternative scenario, would have a relatively larger export growth in *Prediction 1.* But the nature of the three implications derived from my model remain unchanged.

3.6 Assuming Imperfect Correlation in Export Profitability Across Products

So far, I have assumed perfect correlation of export profitabilities over time and across products. Yet, going back to the original definition of μ^{Nj} ($\mu^{Nj} = d^j - c_x^j$), it may be reasonable to argue that the unknown export costs c_x^j are constant across products; but less so that they have the same uncertain demand component d^j.

Here I explore how my initial predictions vary by assuming positive but imperfect correlation in export profitabilities across products. This essentially means that exporting product A, the least costly one, to market d provides incomplete information about the profitability of exporting product B to that destination. Thus, in order to make a decision on exporting product B in $t = 2$, we have to consider the realisation of μ^{NA} in $t = 1$, and how both profitabilities are correlated.

Here, I assume that export profitabilites of both products follow identical distributions, $G(\mu^{NA})$ and $G(\mu^{NB})$. Also, I need to consider the expected value of μ^{NB} given the realisation of μ^{NA}, expressed as $E(\mu^{NB} \mid \mu^{NA})$.

The new assumption of imperfect correlation does not have any effect on the *simultaneous exporting* decisions, nor on the decision to export product A in $t = 1$ as part

[14]See Equation A.14

[15]See Appendix A.1.3

of the *sequential exporting* strategy, because firms do not need to consider any previous information from product A. [16] Indeed, this does not affect the expected values for A in $t = 2$. But it does affect the output choice of product B in $t = 2$ in the *sequential exporting* decision, and hence the expected values for $t = 2$. Following Albornoz et al. (2012), who consider the convexity of the maximisation function and Jensen's inequality, I obtain that the expected value of profits increase when the output decision is made considering μ^{NA}. By maximising those profits to solve for the optimal output level, denoted as $\bar{q}_2^B$ to distinguish it from the perfect correlation case, I achieve the following:

$$\bar{q}_2^B = \frac{E(\mu^{NB} \mid \mu^{NA}) - c_p^B - \tau^B}{2}. \tag{3.19}$$

Subsequently, I estimated the expected value of the *sequential exporting* decision considering imperfect correlation. As a first step, I needed to define the expected value of μ^{NB} given μ^{NA} employed in Equation 3.19. For simplicity, again following Albornoz et al. (2012), I assume that these profitabilities follow a bivariate normal distribution, with parameters $(E\mu^{NA}, E\mu^{NB}, \sigma^A, \sigma^B, \rho)$. Thus, I obtain the following:

$$E(\mu^{NB} \mid \mu^{NA}) = E\mu^{NB} + (\mu^{NA} - E\mu^{NA})\rho\frac{\sigma^A}{\sigma^B}. \tag{3.20}$$

This outcome shows that the output choice of B in $t = 2$ considers not only the export profitability from product A, both in expected and actual terms, but also the statistical dependence between μ^{NA} and μ^{NB}, represented by $\rho\frac{\sigma^A}{\sigma^B}$, henceforth denoted as ω.

Following the original model, now in a context of imperfect correlation between export profitabilities, a firm decides to export B in $t = 2$ in a *sequential exporting* strategy if $E(\mu^{NB} \mid \mu^{NA}) \geq 2F_d^{1/2} + \tau^B + c_p^B$, since the total profits from exporting B must be greater or equal to the fixed entry costs. From that criterion, and using Equation 3.20, I can get a maximum value for those fixed entry costs, below which it is convenient to export B in $t = 2$. Moreover, also from Equation 3.20, I am able to find a cutoff realisation of μ^{NA} above which a sequential exporter will sell B in such period. That cutoff is in function of the known costs, the expected value of μ^{NB} and, more relevant, the statistical dependence

[16] I should recognise, however, that it is possible that the outcome of product B in $t = 2$ affects the decision on product A in $t = 1$, as firms take expected values and work with imperfect information. But in this chapter I am interested in the decision on product B in $t = 2$, given the realisation of A in $t = 1$.

between both profitabilities, ω:

$$\mu^{*^{NA}}(\omega) \equiv (\frac{1}{\omega})(2F_d^{1/2} + \tau^B + c_p^B) - (\frac{1-\omega}{\omega})E\mu^{NB}. \tag{3.21}$$

In order to get to this final relation, I had to consider the case in which μ^{NA} and μ^{NB} follow a bivariate normal distribution with parameters $(E\mu^N, E\mu^N, \sigma, \sigma, \rho)$, meaning that $E\mu^{NA} = E\mu^{NB}$. $\mu^{*^{NA}}$ is then employed to obtain, expressed in $t = 0$ expected terms, the value of the profits from exporting product B in $t = 2$, which is:

$$\bar{W}(\tau^B; c_p^B; F_d) \equiv \int_{\mu^{*^{NA}}(\omega)}^{\overline{\mu^N}} [(\frac{E(\mu^{NB} \mid \mu^{NA}) - \tau^B - c_p^B}{2})^2 - F_d]\mathrm{d}G(\mu^{NA}). \tag{3.22}$$

What is relevant is how this cutoff $\mu^{*^{NA}}$ varies with changes in ω; namely, how the cutoff varies with the statistical dependence between μ^{NA} and μ^{NB}. Taking the derivative of the cutoff with respect to ω, I obtain:

$$\frac{d\mu^{*^{NA}}}{d\omega} = \frac{E\mu^{NB} - (2F_d^{1/2} + \tau^B + c_p^B)}{\omega^2}. \tag{3.23}$$

The effect of ω on the cutoff depends on the numerator, and can be summarised in the following proposition:

Proposition 2:*If $E\mu^{NB} > 2F_d^{1/2} + \tau^B + c_p^B$, the effect of ω on $\mu^{*^{NA}}$ will be positive, meaning that the value for the profits from exporting B in $t = 2$ will be lower ($\bar{W}$ falls), because in that case it is better to export B in $t = 1$. The converse occurs if $E\mu^{NB} < 2F_d^{1/2} + \tau^B + c_p^B$, since now $\mu^{*^{NA}}$ falls with ω, implying a higher value for the profits from exporting B in $t = 2$ ($\bar{W}$ rises). In that case, the closer to perfect correlation, the more worthwhile it is to export B in $t = 2$.*

3.6.1 Implications for Prediction 2 (Extensive Margin)

The assumption of imperfect correlation in export profitability across products has no effects for the predictions on the *intensive margin* (export growth) and the *exit*. It does, however, have an implication for the prediction on the *extensive margin* (entry). Now the probability of exporting a new product to destination d in $t = 2$, having previously exported a cheaper product in $t = 1$, is not only a function of the known costs, but also a function of the expected export profitability for that new product and the statistical dependence ω.[17] In other words, now this entry probability is a function of the minimum cutoff $\mu^{*^{NA}}$ obtained in Equation 3.21. This is expressed as follows:

$$Pr(e_2^j = 1 \mid e_1^A = 1 \& e_1^j = 0) = 1 - G[(\frac{1}{\omega})(2F_d^{1/2} + \tau^j + c_p^j) - (\frac{1-\omega}{\omega})E\mu^{Nj}] > 0. \quad (3.24)$$

It can be observed that such entry probability is still positive; hence, still higher than the probability of exporting a new product in a subsequent period $t > 2$, which is *zero*, according to Prediction 2. Nevertheless, this positive likelihood now varies according to the dependence between export profitabilities and the expected μ^{Nj}. This outcome holds both with and without *trade liberalisation*.

In summary, the entry probability with a new product in $t = 2$ rises by reductions in the known costs: the fixed entry cost F_d, the unit trade cost or tariff τ^j, and the unit production cost c_p^j. It will also rise the higher the expected export profitability from product j is. As for the statistical dependence ω, that for simplicity can be treated as the correlation ρ, its effect on the entry probability depends on the expectation of μ^{Nj} with respect to the known costs. Thus, if $E\mu^{Nj} < 2F_d^{1/2} + \tau^j + c_p^j$, a rise in ω decreases the cutoff $\mu^{*^{NA}}$, increasing the value for experimentation, and consequently raising the entry probability with product j. The opposite, a reduction of such entry probability, occurs if $E\mu^{Nj} > 2F_d^{1/2} + \tau^j + c_p^j$, since it is more convenient in that case export the two products simultaneously.

3.7 Conclusions

This chapter develops a theoretical model pursuing to illustrate the firms' export strategy in a particular destination, with uncertain export profitabilities, assumed to be perfectly correlated over time and across products. Depending on their known costs and expected profits, a firm may decide to export products sequentially over time, simultaneously, or not to enter at all into that destination.

From that framework, three predictions are derived on the export dynamics of new exporters –starting to export to market d in $t = 1$– in terms of their growth in the intensive margin, extensive margin and their exit probability from a product export business, considering the role of trade liberalisation and the difference between "non-core" and "core competence" products.

[17]See Appendix A.1.2 for the proof of Prediction 2 on the extensive margin.

In summary, these three predictions state that new exporters, conditional on survival, tend to grow more in $t = 2$ than firms with longer experience in market d at the intensive and extensive margins, being more likely to expand their sales of a product and introduce another product to that destination one period later. However, those newcomers are also more prone to decide to exit the business of a product in that destination. Trade liberalisation, expressed as an unanticipated tariff elimination by market d in $t = 2$ on products from country o, boosts the intensive margin growth of new exporters, as well as helping them prevent their exit from the business of a particular product. It also encourages firms to experiment with new products in the future, but that boost is larger for the expert firms. Finally, the extensive margin and exit prevention likelihoods are larger for better performing (core competence) products; whereas the intensive margin growth tends to be larger for a "non-core" product.

Despite the interesting implications from my theoretical framework, I am aware that there are several issues not contemplated, which may enrich the model or be subject for further research. My model does not consider a potential experience of firms in other markets, which may affect their entry and export decisions in the market of interest. In the empirics presented in Chapter 4, I control for that issue; but it would be interesting to incorporate it into a theory. Likewise, I briefly mentioned the implications on my theory from allowing for entry costs to vary across products; but definitely a deeper analysis may be put forward in the future. Also, further approaches may focus on the influence of neighbouring firms in the export decisions of one single firm in a particular market, not regarded in my approach. As for trade liberalisation, my framework presents it as an unanticipated tariff elimination by a country. However, firms in the reality may have the ability to anticipate a trade reform by the country of interest, which certainly affects their export decisions in that market. A clear step forward would be to incorporate that ability in a theoretical model and see how firms construct their export and entry decisions across products. More interestingly, while my current model is a two-period analysis where firms make decisions from one period to the other, those decisions may actually be delayed depending on several factors. I address that issue in my theoretical model presented in Chapter 5.

4 Sequential Exporting Across Products: Evidence from Peru

4.1 Introduction

A growing literature has explored the dynamics of exports at the firm level, usually highlighting the continuous entry and exit flow of firms into the export activity, despite having borne entry costs. Eaton et al. (2008), for example, show in the Colombian case that firms that start and stop exporting tend to account for limited contributions to overall export revenues. Freund and Pierola (2010), in the Peruvian context, report that this exit flow is especially likely after the first year exporting, and particularly likely for small firms. Similarly, analysing USA imports at the country level, Besedeš and Prusa (2006a) show that trade relationships involving either small countries, small exporters or low initial values tend to be short lived.

Other studies focus on the role of productivity and export experience as determinants of success in the export market, pointing to the fact that the most productive firms decide to start exporting, paying sunk entry costs, and increasing their knowledge about their productivity through learning and experimentation, compared to non-exporters. Roberts and Tybout (1997) find that this export experience is determinant in Colombian plants' decision to enter foreign market; but such experience depreciates once they stop exporting.

All these studies focus on export dynamics at the firm or country level; but none of them establishes differences in these dynamics across products. Only Besedeš and Prusa (2006b) makes a difference between differentiated and non-differentiated products in their export survival analysis. Moreover, in this literature the issue of trade liberalisation is just indirectly addressed by, for instance, including dummies accounting for a regional or bilateral trade agreement between countries, like Brenton et al. (2010) in their survival analysis for developing countries. Hence, the effect of trade liberalisation on firm export entry and exit decisions is still a strand for potential research.

Recent literature on firm export dynamics has emphasised the analysis of new exporters as opposed to more experienced firms in the foreign market. In a descriptive analysis for Colombian plants, Eaton et al. (2008) report that most new entrants into the export business leave after one year, and a small minority become incumbents. More recently, Albornoz et al. (2012), focus their analysis on firms with only one-year experience in the Argentinean industry, finding that this type of firm tends to drop out of the export business very quickly; however, new entrants achieving to remain in the market grow at both the intensive margin (export growth in one destination) and the extensive margin (entering new destinations). Thus, those new exporters experience a *sequential exporting* process.

This *sequential* behaviour researched by Albornoz et al. (2012) was in terms of market (destination) diversification. How do export dynamics work across products within one particular destination? Moreover, this *sequential* behaviour has not been tested yet in a context of trade liberalisation, which represents a gap to be bridged.

In Chapter 3, I presented a theoretical model pointing at the question stated above, reorienting the *sequential exporting* analysis, now focusing on the dynamics new exporters undergo in terms of product diversification within one destination, incorporating trade liberalisation into that analysis, as well as the differences in firms' export dynamics between products; for instance, between better performing (core competence) products and worse performing ones. This chapter now contributes to the literature by empirically testing the predictions from that theoretical model. Given the data availability and the recent occurrence of trade reforms consolidated with the enactment of a Free Trade Agreement in 2009, the relation between Peru and the United States represents a good scenario to analyse. As a result, this chapter is one of the first researches on the effect of the recent USA-Peru Free Trade Agreement on the performance of Peruvian firms in the American market.

This chapter contributes to the literature in a number of ways. It investigates whether Peruvian firms with one-year experience in the USA market are more likely than more experienced firms to grow their exports to that country at the intensive (growth in one product) and extensive margin (entry with other products). It also researches whether these newcomers are more likely to give up exporting a product to the USA than more experienced firms. The chapter additionally explores the role of trade liberalisation, analysing how the aforementioned process undertaken by Peru with the United States affects these dynamics. Finally, it investigates whether these dynamics are more evident for core competence products.

I exploit a very rich dataset of Peruvian firms that exported to USA between 2006 and 2013 to address these questions, estimating three different models on export growth, entry and exit. A particular challenge for this and future researches is that the enactment of USA-Peru FTA occurred simultaneously with the world economic crisis that negatively affected Peruvian exports. I disentangle the effects of the crisis from those of liberalisation by controlling for the change in tariffs levied by USA on each Peruvian product exported, as well as considering year fixed effects.

The results support the hypotheses from the model in Chapter 3, showing that firms with only recent experience in the USA market, conditional on survival, tend to experience a larger intensive margin export growth with the first products they sell to that market, as opposed to subsequent products and more consolidated firms. They are also more likely to experiment with a new product in that destination in the future (extensive margin). However, these new firms are more prone to drop out of the export of a product in USA than incumbents.

Trade liberalisation, expressed as the tariff elimination by USA on Peruvian products in 2009, helps the one-year experienced firms to remain exporting a product to that market. On the other hand, such tariff elimination facilitates the decision by more experienced firms to experiment in the USA market by selling new products there.

The export growth on the intensive margin by new exporters is increased if the firm exports a non-core competence product; namely, a product in which the firm does not tend to perform well in terms of sales. In contrast, the extensive margin growth is boosted for core competence products and if the firm has previously exported a similar product. Moreover, a new exporter selling a core product to USA is less likely to exit that business. These core competence effects on the new exporters' performance tend to be more relevant for the smallest firms.

The remainder of the chapter is organised as follows. Section 4.2 provides details of the Peru-USA trade relations which motivates my research. Section 4.3 describes the data and provides a descriptive analysis of Peruvian firms' export performance in the USA market. Section 4.4 presents the three empirical models with their respective results. Section 4.5 complements with some robustness checks. Section 4.6 concludes.

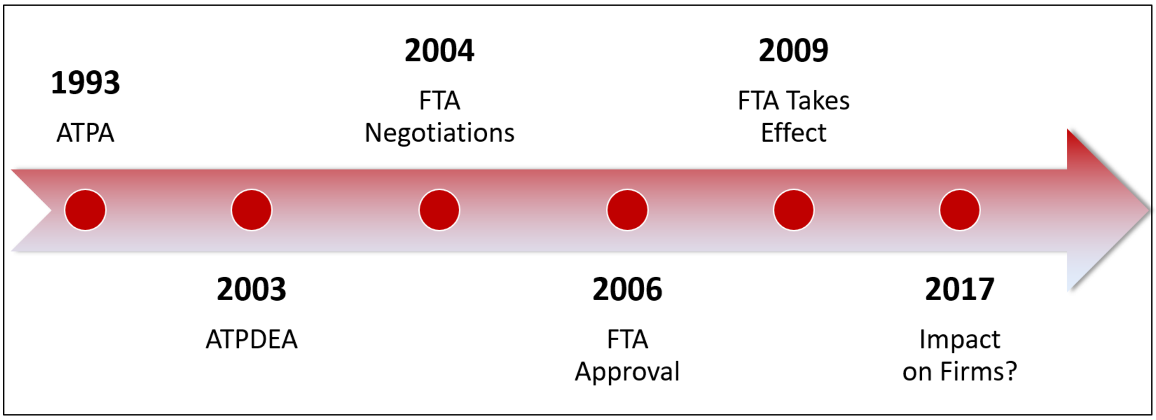
4.2 USA-Peru Trade Relations

This section outlines the stages undergone by Peru and the United States in terms of their bilateral trade policy from the 1990s to 2009, the year in which the Free Trade Agreement between these countries came into force.

After a severe economic crisis in the late 1980s, characterised by a dramatic hyperinflation, enhanced by an intense state control and protectionist measures, Peru started to undertake a series of liberal economic reforms, including a determined increase of its trade openness, unilaterally reducing tariff levels and dispersion. Between 1991 and 1999, those tariff reductions led to a flatter and more uniform tariff structure, moving from 39 to only 4 different tariff categories, with rates between 12% and 30%. Indeed, 84% of products were levied the lowest rate of 12%. This open trade policy also involved the elimination of export tariffs, import licences, import prohibitions, along with the simplification of sanitary controls.

In parallel, the United States, historically Peru's most important trading partner, implemented since 1991 unilateral trade preferences to several Peruvian exports through the Andean Trade Preference Act (ATPA) and the Andean Trade Promotion and Drug Eradication Act (ATPDEA), which were periodically renewed, although without a uniform frequency.

Figure 4.1: Peru-USA: Evolution of Trade Relations



4.2.1 Before the USA-Peru Free Trade Agreement

4.2.1.1 Andean Trade Preference Act (ATPA)

ATPA came into force in Peru in August 1993 –initially enacted in December 1991– with the purpose of expanding private opportunities and investment in non-traditional sectors of the Andean countries, as an alternative to illegal drug production, diversifying their economies and expanding their exports. Through ATPA, the USA president proclaimed duty-free treatment for eligible articles from Peru, as well as Bolivia, Colombia and Ecuador.

Under ATPA, about 5,600 tariff lines, out of over 10,000 8-digit codes, were covered by USA unilateral trade preferences. These preferences favoured a wide variety of industries, but explicitly excluding most textiles and apparel, certain footwear, canned tuna, petroleum and derivatives, certain watches and watch parts, certain sugar products, rum and tafia. For some products, duty-free entry under ATPA was subject to additional conditions. For example, imports of sugar and some other agricultural products (beef, dairy products, certain food preparations and cotton fibers), remained subject to USA tariff-rate quotas (TRQs) and food-safety requirements. In-quota shipments of these products subject to TRQs were eligible to free-duty entry under ATPA. Other products, like certain leather handbags, luggage, wallets, portfolios, work gloves and leather wearing apparel were eligible for reduced rates of duty, but not free (between 3.5% and 22.5%).

4.2.1.2 Andean Trade Promotion and Drug Eradication Act (ATPDEA)

ATPA expired in December 2001 and was renewed in August 2002 as ATPDEA. This renewal was retroactive from ATPA's expiration date. This new Act was extended until the end of 2006, aiming to renew the ATPA benefits, as well as to extend the trade preference to a set of new 700 tariff lines, previously ineligible for preferences under the original ATPA, including certain textiles and apparel, footwear, tuna in foil or other flexible airtight packages (not cans), petroleum and derivatives, watches and watch parts (including cases, bracelets and straps). Leather and other manufacturing products, previously eligible for reduced rates of duty under the original ATPA, became eligible for duty-free treatment under ATPDEA. 17 footwear tariff lines were still subject to reduced rates of duty.

However, some other products were still excluded from any preferential treatment under ATPDEA: certain textile and apparel articles; canned tuna; above-quota imports of certain agricultural products subject to TRQs, including sugars, syrups, and sugar-containing products; rum and tafia.

Textile and apparel products under ATPDEA, elaborated with local inputs, were eligible to duty-free entry to the USA up to an amount equal to 2% of total USA apparel imports. That share steadily increased until 5% in 2006. Additionally, apparel products elaborated with USA inputs were eligible for duty-free treatment, without any quota or other restriction.

As a general rule, ATPDEA products must be either wholly grown, produced, or manufactured in an ATPDEA country, or be "new or different" articles made from substantially transformed non-ATPDEA inputs. The cost of the ATPDEA inputs and the direct costs of processing in one or more ATPDEA countries must total at least 35% of the customs value of the product when entering USA.

Since 2006, the USA Congress authorised several short-term extensions of ATPDEA, before allowing it to lapse in February 2011. In October of the same year, ATPDEA was again renewed retroactively, until the Act finally expired in July 2013.

The USA also used to offer unilateral trade preferences under a Generalised System of Preferences (GSP), either duty-free entry or reduced tariffs, to over 4,650 products of approximately 140 developing countries. It was enacted in January 1976, for 10 years, and was renewed several times. In August 2002, the GSP was renewed until December 2006. The aim of this programme is to promote economic growth of developing countries by encouraging exports. In 1989, according to USA statistics, 25% of Peruvian exports to that country entered under GSP; however, in 2003 they only accounted to 4.6%, surely because a large share of these former GSP exports opted for the ATPA regime since 1994.

4.2.1.3 Benefits of ATPA-ATPDEA to Peruvian Exports to USA

Since ATPA came into force, Peruvian exports to USA increased at an average annual rate of 12.7% from 1993 to 2001. However, that was not a sustained growth, with a null growth in 1993-1994, a high increase (27%) in 1995-1998, and a negative growth (-1.6%) in 1999-2001. Exports favoured with ATPA accounted for 39% of Peruvian exports to USA in 2001. That year, the main exports were copper (31% of total exports), textiles (22%) and agricultural products (12%). Additionally, a very small number of products took advantage of ATPA. In 2001, the 10 main products favoured accounted for 99.4% of ATPA exports to USA. These products included jewels, asparagus, mangoes and onions.[18]

With the implementation of ATPDEA, the textile and apparel sector was clearly the main favoured industry, as part of it was eligible for free entry to the USA market. From 2002 to 2008, Peruvian exports to USA significantly rose from about US $ 1.9 billion to US $ 5.8 billion approximately. About 20% of Peruvian exports to the United States were under ATPDEA in 2002, and that share rose to 54.2% in 2008. In that year, 30 products accounted for the 91% of exports benefited under that regime, among which oil

[18] Ministry of Economics and Finance of Peru (2001), "Bulletin of Fiscal Transparency".

and derivatives, t-shirts and vegetables like asparagus clearly stand out.[19]

Despite the importance of these mentioned trade preference regimes, they were not the only drivers of Peruvian exports to the American market. Indeed, most of these exports, such as minerals like gold, tin and zinc, entered that market without any trade preference, and also experienced a positive evolution. Indeed, from 2002 to 2008, exports from non-ATPDEA products rose from about US $ 1.4 billion to US $ 2.4 billion.[20]

4.2.1.4 Trade Preferences by Other Trading Partners

- Chile: since July 1998, constant tariff reduction and elimination to Peruvian exports. By 2004, 73% of tariff lines were already liberalised.
- Brazil: since August 1999, preferences to about 23% of tariff lines.
- Argentina: similarly, 23% of tariff lines were offered any trade preference since June 2000.
- Andean countries: by late 2004, 100% of Peruvian exports had duty-free access to Bolivia and Colombia. These shares were 93.7% for Ecuador and 99.6% for Venezuela.
- European Union: since late 1991 an Andean Generalised System of Preferences was established, allowing some trade preferences to all industrial products (chapter 25 to 97 of HS tariff lines) and some agricultural and fishery goods. This regime has been periodically renewed. In 1999, it was estimated that 82% of Peruvian exports to the European Union entered under GSP, with products as asparagus, textiles and apparel, fish and crustaceous as the main beneficiaries.

4.2.2 The USA-Peru Free Trade Agreement

In November 2003, the USA government announced its intention to start negotiations with Peru and Colombia, as well as Ecuador and Bolivia, in order to achieve a Free Trade Agreement (FTA) with each of these countries. Negotiations began in 2004, and finished after 13 negotiation rounds. The Free Trade Agreement between Peru and the United States was enacted in Washington in 2006, coming into force on the 1st of February 2009.

[19] Source: US International Trade Commission.

[20] Ibid.

Under this agreement, Peru consolidated the preferential access to the USA market for products eligible under the ATPDEA regime; and, more importantly, expanded those preferences to the rest of Peruvian export supply. Thus, the FTA means a big step forward, providing more security to the preferences previously enjoyed by many products, making it more difficult to cancel them. Given that advantage, it was expected that the USA-Peru FTA would contribute to the growth and diversification of Peruvian exports in the medium run, especially for non-traditional exports.[21]

Since this is a bilateral agreement, this FTA also entails the preferential access to the Peruvian market of USA exports, providing a wider availability of consumption goods, as well as intermediate inputs and capital goods.

4.2.2.1 Objections Against the FTA

During the process to attain the final agreement, several agents displayed their scepticism about the benefits of the USA-Peru FTA to the Peruvian industry. Social movements, trade unions, left-wing parties and some non-governmental organisations argued that the conditions under which the treaty was approved involved high risks, which were not sufficiently compensated for by the potential benefits. Among those risks, such movements mentioned threats related to judicial sovereignty, food safety, intellectual property, protection of the environment, biodiversity, natural resources, public health, etc.[22]

Sectors considered sensitive to those threats are the non-exporting agricultural industry and small and micro businesses. Representatives from those sectors alleged that the FTA would mean the exit from business for domestic firms, especially the smallest and least technologically skilled, in unequal conditions to compete with larger highly skilled and more efficient companies. Indeed, in December 2005, right after the end of the USA-Peru negotiations, the then leader of the Peruvian Agricultural Convention (CONVEAGRO in Spanish) declared that the FTA would condemn the 97 % of Peruvian agricultural industry to bankruptcy. The non-exporting agricultural sector, it was argued, would be severely affected by the entry of heavily subsidised agricultural products from USA. The latter was deemed as a serious danger, as agriculture accounted for over 20% of Peruvian

[21] Ministry of Foreign Trade and Tourism of Peru (2012), "Estudio de Aprovechamiento del TLC Perú-EEUU - Tercer Año de Vigencia del TLC", on *http://www.acuerdoscomerciales.gob.pe*

[22] Fernández Maldonado (1999), "El TLC con Estados Unidos y su Impacto sobre el Empleo", on *http://revistaargumentos.iep.org.pe/articulos/el-tlc-con-estados-unidos-y-su-impacto-sobre-el-empleo/*

labour force in 2006, and most farmers lived in poor rural areas. Among the Peruvian agricultural products judged as highly sensitive to that liberalisation process were cotton, maize, sugar, meat and dairy products.[23]

Another objection was given in 2007 by Pedro Francke, a Peruvian politician, specialised in health issues, arguing that the FTA was not necessary since many products were already liberalised under ATPDEA, and would actually "equalise the treatment" for both Peruvian and American products. Additionally, he was concerned about a potential rise in the price of medicines, due to tighter intellectual property rules.[24]

4.2.2.2 USA-Peru FTA Liberalisation Schedule

The United States offered a total liberalisation of 99.5% of its tariff lines in a period up to 17 years from 2009. This offer includes 100% of non-textile industrial goods imported from Peru, liberalised since the start of the FTA enforcement.

A total of 6,417 tariff lines, 60% of all products included, were immediately liberalised under the FTA, whereas about 4,000 lines got their ATPDEA preference confirmed by the FTA. Hence, 98% of products included in the USA schedule are already liberalised from 2009. The non-immediately liberalised products are detailed in Table 4.1, their trade costs being gradually reduced.

[23] BBC World (2006), "Perú y las dos caras del TLC", on $http$: $//news.bbc.co.uk/hi/spanish/business/barometro_economico/newsid_4915000/4915384.stm$

[24] Gran Combo Club (2007), "Los debilitados argumentos en contra del TLC", on $http$: $//grancomboclub.com/2007/11/los-debilitados-argumentos-en-contra.html$

Table 4.1: USA-Peru Free Trade Agreement - Liberalisation Schedule for Non-Immediately Liberalised Products

N° Tariff Lines	Industries	Trade Cost	Fully Liberalised By
3	Wool	Tariff	2013
21	Footwear, Tuna Fish and Dairy	Tariff	2018
51	Meat, Chocolate, Rum and Tobacco	Tariff	2023
4	Dairy	Tariff	2025
26	Dairy	Quota	2023
56	Cheese and Condensed Milk	Quota	2025
47	Sugar	Quota	Not liberalised

Source: PROMPERÚ

As for Peru, it has offered immediate free access to 76% of its tariff lines. The rest is in process to be liberalised between 2 and 17 years since the FTA took effect. Within the products immediately liberalised, the list includes 451 agricultural tariff lines (56% of all agricultural products). On the other hand, 125 products considered sensitive by Peru were given a liberalisation schedule greater or equal to 10 years. Additionally, Peru can apply a special safeguard per volume for 36 sensitive products, such as evaporated milk, cheese, lamb meet, rice, and chicken parts, among others. Finally, Peru promised to extend to the USA more favourable conditions offered in future agreements to 139 tariff lines.

4.2.3 Impact on Peruvian Exports

Since the arrangement of the Free Trade Agreement between Peru and the United States, exports from Peru to that country rose from US $ 5.9 billion in 2008 to about US $ 7.4 billion in 2013, representing an average annual growth rate of 5.81%. Nevertheless, in some years like 2011 and 2009 itself, exports experienced significant falls. Indeed, the decline occurred in 2009, the year the FTA came into force, was mainly due to the economic crisis affecting USA, as will be more clearly observed in Section 4.3, with the actual firm-level data utilised.

Although the overall trend of Peruvian exports to USA has been positive since the start of the FTA, a very large part of that increase is accounted for by a small number of products; most of them traditional exports. In fact, raw gold in 2013 accounted for about 28% of total exports, followed by two oil and fuel tariff lines, accounting for almost 15%, and raw silver (5%). The first non-traditional export in the list is asparagus, only representing 3.4% of total exports to the American market. In 2013, the top 20 Peruvian products exported to the United States account for almost 75% of total exports, meaning a huge concentration of exports in few types of products. Within that group, other non-traditional exports can be found, such as cotton t-shirts, fresh grapes and some fishery products; but the majority of the products in that list belong to the mining and oil industries.

The total number of products exported from Peru to the United States has steadily increased since the FTA became effective. The year before, 2008, a total of 2,099 different products were sold to USA, whereas in 2013 the amount rose to 2,342. However, like the export growth, the number of products exported also underwent decreases in some years, such as 2010 and 2013.

Also, a study by the Ministry of Foreign Trade and Tourism of Peru found in 2012 that after three years of the start of the FTA, a total of 1,973 new firms began exporting to the United States, and 90% of them were small and micro enterprises. Indeed, 535 of these new exporting firms were small firms, and 1247 were micro enterprises. However, only 180 out of the 1973 new exporting firms actually exported during all the three years analysed.[25]

These overall figures give a preliminary idea of how difficult it is for Peruvian firms to survive in the USA export market. Such difficulty is more evident at the firm-product level, as I present in the next section. However, the positive export evolution from Peru to USA described earlier might tell us something about the potential growth of surviving firms at both the intensive and extensive margin, in terms of products. How likely are

[25]That study considered as large firms those that exported over US $ 10 million per year; medium firms were those exporting between US $ 1 million and US $ 10 million; small firms exported between US $ 100,000 and US $ 1 million; and finally micro enterprises exported less than US $ 100,000 per year.

Peruvian firms to intensify their sales of a particular product in the USA market? How likely are they to introduce a new product to that destination? How long does it typically take to a firm to sell a product to USA for the first time? How vulnerable are they in terms of their probability to fail? Are there differences in the dynamics between new entrants and expert firms? What is the role of trade liberalisation with respect to those dynamics? Are there difference in the performance across products? All of these concerns are addressed in this chapter and in Chapter 5.

4.3 Data and Descriptive Analysis

4.3.1 The Data

4.3.1.1 Data Collection

The main stage of my collection process was to obtain Peruvian exports data at the firm level. For that purpose, I contacted the Foreign Trade Society of Peru (COMEXPERÚ in Spanish), a business union which manages data on daily export and import transactions from different sectors. This information is collected from the Peruvian Tax and Tariff Agency (Superintendencia Nacional de Administracion Tributaria SUNAT in Spanish).

The time period of the original datasets is from 1993 to 2013, and each of the eight datasets compiles information on daily export transactions per firm, from the following sectors:[26]

1. Agriculture, including traditional commodities like coffee, cotton and sugar, as well as non-traditional products like asparagus, grapes, artichokes, capsicum, among other fruits and vegetables.
2. Basic Metal Industries, including processed minerals, like gold, silver, copper, steel and iron, utilised as inputs for other production processes.
3. Chemical, including products like medicines, cosmetics, diverse body care items and other products containing chemical solutions.

[26] Initially, I had also collected custom-level exports data from other sectors like mining, fishery and oil and derivatives, which traditionally account for more than 50 % of total Peruvian exports. However, since the focus of this thesis is on manufacturing industries, those sectors were discarded from the analysis. I focus on manufacturing industries because, as mentioned earlier, there was a previous controversies on a potential damage by an FTA with the USA to Peruvian manufacturers, especially the smallest firms.

4. Jewellery, including jewels made of different metals like gold and silver. This is the sector with the least amount of tariff lines exported.
5. Metallic-Mechanics, including machinery and different tools made of minerals like steel, iron and aluminium (nails, screws, saws, clippers, hammers, among others).
6. Non-Metallic Mining, including mineral-based products like salt, cement, marble, pottery, dishes, glass, among others.
7. Textile and Apparel, including products like T-shirts, trousers, shirts and other kinds of clothes and fabrics.
8. Timber and Paper, including gross timber and diverse products made of timber, like furniture, as well as books, notebooks and other products made of paper and cardboard.

Each of the transactions from these eight industries contains very detailed information, such as: Firm tax code, firm name, tariff code, tariff description, sector and industry (subsector), export type (traditional or non-traditional), port of shipment, port of arrival, year, month and day of the transaction, export value (US $), weight (kg.), quantity and unit of measure.

From the Peruvian Tax and Tariff Agency, I have also collected some firm-level information, such as data on the year each firm came into existence and, where relevant, the year they exited the market, as well as the region of location of their main headquarters. Unfortunately, it was not possible to collect other relevant firm-level information, such as their balance sheet, domestic sales, cost structure and use of inputs, since it is not available for all the firm universe. There is an annual publication of financial information, but it is only for the top 10,000 Peruvian firms in terms of turnover. The sample is not constant over time.

Finally, in order to account for trade liberalisation, I have collected data on *ad valorem* tariff rates levied by the United States at the 8-digit level, from the World Integrated Trade Solutions (WITS) database of the World Bank. The tariff rates collected derive from the Most Favoured Nation (MFN) scheme, until 2008. From 2009 onwards, I make use of the tariffs valid under the Free Trade Agreement (FTA) between Peru and the United States. That information comes from a detailed spreadsheet prepared by the Peruvian Agency for Export Promotion (PROMPERÚ), containing the whole schedule for the tariff reduction and elimination by the United States on Peruvian exports. Additionally, given that many products were unilaterally liberalised by USA before the enactment of the FTA, under the mentioned ATPDEA scheme, I also collected from WITS the list of 8-digit tariff lines eligible under that regime, with their respective effective tariff until 2008.

Prior to the collection of that main data, I started my thesis research with a basic data collection of Peruvian indicators at the macro level, such as nominal and real GDP, USA-Peru nominal and real exchange rate, exports per destination and sector, balance of payments, among others. The main sources from which this information was obtained were the Central Bank of Peru (BCRP), the Agency for Export Promotion (PROMPERU) and Peru's Tax and Customs Agency (SUNAT).

These indicators were very useful to understand the Peruvian macroeconomic context, and some of them were utilised to document the trade relation between Peru and the United States in the introduction of this thesis. Others, such as the USA GDP deflator and the nominal and real exchange rates were employed in the subsequent processing of the custom-level data.

4.3.1.2 Data Processing

In order to get to the final dataset for the research, I initially worked on the original export transactions datasets provided in Excel format. Subsequently, I transferred each of the eight datasets to Stata. For each firm, I created the following list of general information:[27]

- Total annual exports per firm (US Dollars).
- Number of trading destinations per firm, annually.
- Number of tariff codes exported by firms, annually.
- Total annual exports to a specific destination per firm (US Dollars).
- Total annual exports of a specific tariff code per firm (US Dollars).
- Firm dummies according to destination exported to.
- Firm dummies according to the tariff code exported.
- Dummies referring to the year each firm exported.
- Number of years within the sample, in which each firm exported.

[27] I had also collected import transaction data, but its main shortcoming was that there was no information on the importing firm in most cases.

During the conversion process, I took the chance to eliminate from the dataset those transactions that are not subject of the analysis, such as the transactions made by individuals, and those which had as destinations regions like free zones, international seas, neutral zones, among others, in order to have a uniform firm-product dataset of sales to final destinations. Additionally, those cells from the columns of export values and weight, with a hyphen instead of a number, were assumed to be zero and dropped from the dataset for not being reliable enough. After all that editing, it was decided to disregard the transactions of the first 5 years of the sample, since it was deemed as not so relevant for my analysis, which is more interested in the enactment of the USA-Peru FTA in 2009. Moreover, during that period between 1993 and 1997, Peru was experiencing several changes that certainly had an effect on firms' decisions. Hence, I finally produced a set of transactions from 1998 to 2013, which is afterwards used for the descriptive analysis.

This conversion and variable creation process was not exempt from complications. The creation of variables related to tariff codes was not possible on Stata for very long datasets like agriculture, textile and apparel and chemical. Hence, it was necessary to make use of the PostgreSQL software to obtain the desired outcome for those sectors. Another challenge was to harmonise the variables created across the eight separate datasets, especially the dummies per destination and tariff code. That issue was solved by encoding the countries' names and product codes on Stata.[28]

Once the mentioned variables above were created for each of the eight sectors, I proceeded to merge the original transaction datasets with the newly created variables per sector. Subsequently, it was appropriate to deal with one important shortcoming: the missing values per firm/product/year. Obviously, there are firms which did not export in a specific year, and that was not reflected in the original datasets as zero values. Hence, I created on Stata those missing observations, which gave the value "zero" for all the variables in the year a firm did not participate in the export market with a product. Some of these zero values were eliminated in a further stage when, by checking the information from each firm, I could certainly know whether the firms exited the business as a whole during the sample period.

As a final result, I obtained for each sector a dataset where each observation is at the firm/year/product/destination level. Since the main interest of this thesis is the USA market, as a next step I selected only the firms which have exported to that country within

[28]Initially, the dummies per destination and tariff code where named in numerical order, starting from 1, in each separate dataset.

the time period. Combining the datasets for the eight sectors, I achieved a broad dataset of Peruvian exports to USA, consisting of 8,976 Peruvian firms, covering the 1998-2013 period. The construction of export transactions per 8-digit tariff line/year led to a total of 3,654 manufacturing 8-digit tariff lines. With this broad dataset, I started the descriptive analysis.

It is important to mention that, in order to get to that final number of tariff lines, a further stage involved merging that combined dataset with another one containing the USA tariffs per 8-digit tariff line/year, considering the effective tariffs before and after the enactment of the USA-Peru FTA, as well as the unilateral trade preferences given by USA to some Peruvian products under ATPDEA. This process involved the elimination of firm-product pairs, due to the lack of consistent tariff data over time. Specifically, some products had no complete information on tariffs between 1998 and 2008, the span prior to the enactment of the FTA. A potential reason for this is the periodical updating of tariff lines under the Harmonised System, involving the incorporation of some lines into a broader one. But other products registered a tariff rate in one year, disappearing from the dataset the year after, to then return afterwards. Hence, I maintained in my sample those 8-digit products from which I had full tariff information before and after 2009, until 2013. That process led to the loss of approximately 33% of the tariff lines from the original 1998-2013 broad dataset. However, that loss does not affect considerably the strength of my final dataset, for various reasons. Firstly, many of the tariff lines discarded belong to non-manufacturing sectors like mining, fishery and oil and derivatives, not contemplated in this research. Secondly, and most importantly, for my subsequent empirical approach, I restrict my analysis to the 2006-2013 period and to firms starting to export to USA since 2006, thus disregarding the tariff information lost between 1998 and 2005.

From the aforementioned 1998-2013 final dataset, I made further transformations so as to generate relevant variables for my econometric approach, to be defined afterwards. Among those transformations, I can highlight the creation of dummies to control for firms with one-year experience in the USA market, the firms' previous experience in markets other than USA, the "core competence" condition of a product, and the fact that a firm has previously exported a similar product to USA in $t-1$ to the one exported in t.

Additionally, in order to categorise these firms by size, I calculated as an approximation the mean of firms' total annual exports throughout the 1998-2013 period, which led to the four groups listed in Table 4.2.[29]

[29] According to this categorisation, 54.16% of firms are very small and only 6.97% are large.

Table 4.2: Categorisation by Firm Size

Size	Mean Annual Exports (US $)
Large	$> 1,000,000$
Medium	$> 100,000 - \leq 1,000,000$
Small	$> 10,000 - \leq 100,000$
Very Small	$\leq 10,000$

4.3.2 Descriptive Analysis

4.3.2.1 Export Statistics

From this original dataset of Peruvian firms that exported at least once to the United States, I plotted the evolution of their exports to that destination from 1998 to 2013 in US Dollars (Figure 4.2) and their annual growth rates (Figure 4.3). Exports follow a continuous growth that gets more pronounced from 2004, but then sharply fall in 2009, exactly the same year the Free Trade Agreement between Peru and the United States came into force. Afterwards, there was a sustained recovery of exports until 2011, and then slightly decreased again from 2012. A similar tendency can be found for the overall exports of this sample.

Figure 4.2

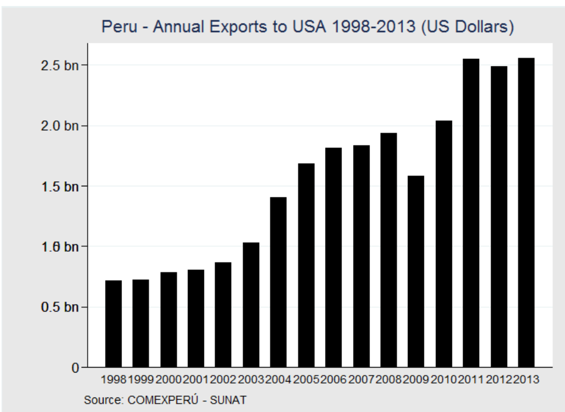
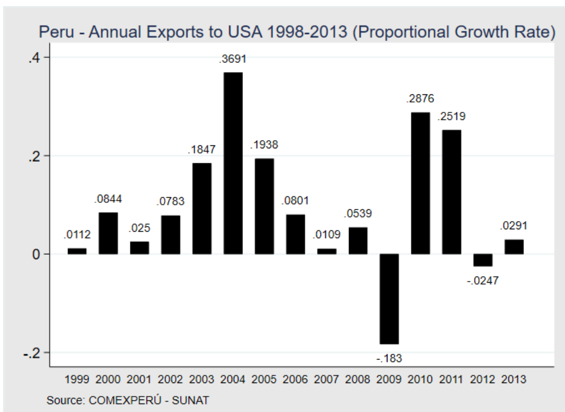


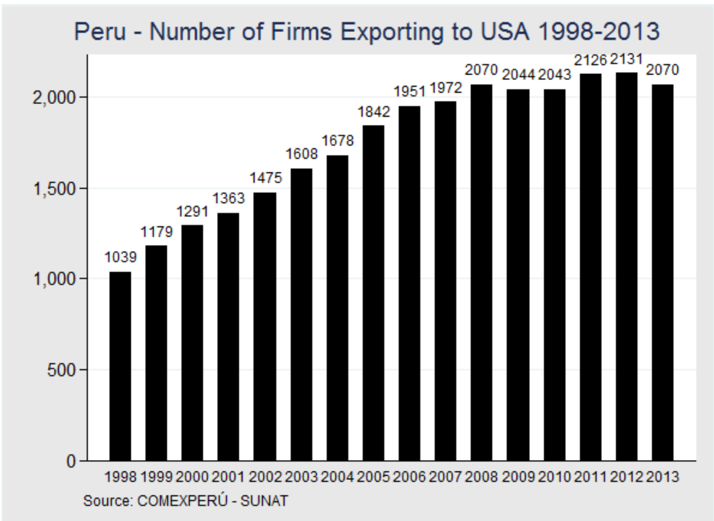
Figure 4.3



The pronounced decrease of exports in 2009, when the enactment of the USA-Peru FTA took place, represents a challenge for the analysis in this paper and further studies, as it is necessary to disentangle the effects of trade liberalisation from those from an economic crisis.

Figure 4.4 displays the evolution of the number of Peruvian firms exporting to USA during the period analysed. Unlike the export volumes, the number of exporters follows a steady pace until 2008 and then roughly constant, despite any external shock produced by the crisis during those years. The main effect of the crisis was, therefore, expressed in export volumes; namely, the intensive margin. This outcome is clearly in line with the findings from Behrens et al. (2013) on the financial crisis effect on Belgian trade. Indeed, the authors found that the fall in exports and imports at the firm-product-country level occurred mostly at the intensive margin, whereas the number of exporting firms, destinations and products sold per market changed only very little.

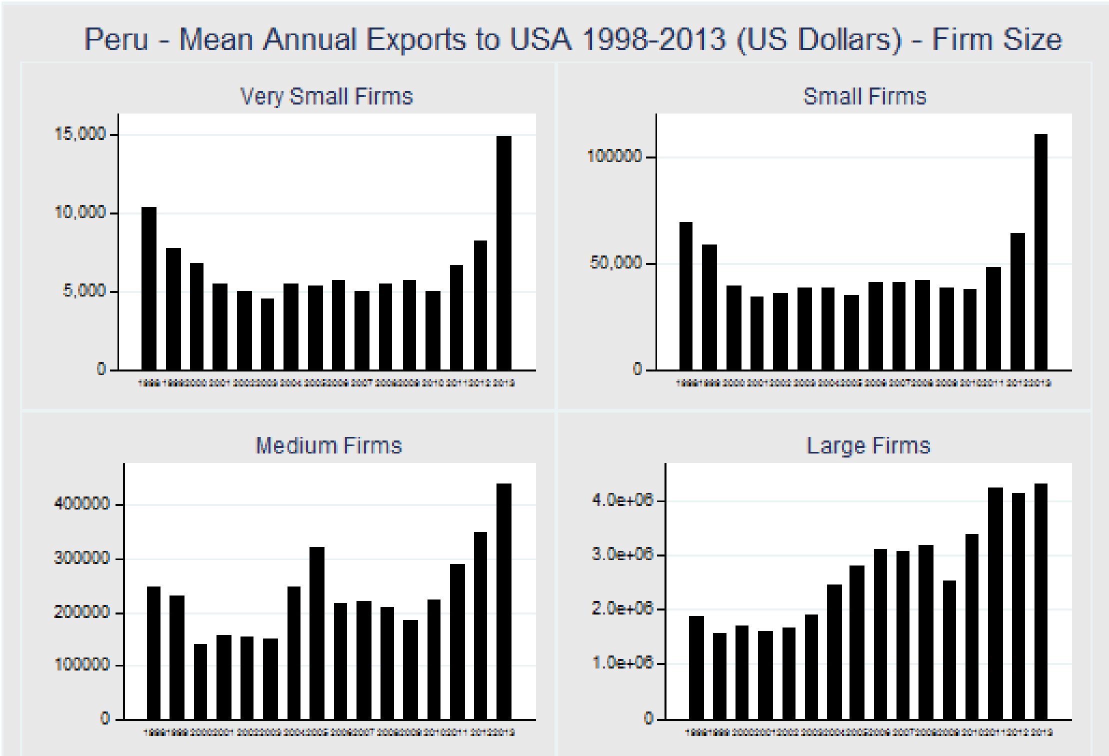
Figure 4.4



According to the categorisation in Table 4.2, 54.16% of firms are very small and only 6.97% are large. I employ this criterion in further estimations; but in this section I compare the evolution over time of the mean annual exports to USA of firms across size categories.

The statistics provided by Figure 4.5 are striking. All types of firms except the large ones experience a continuous positive evolution in exports during the last four years of the sample, exactly when the USA-Peru FTA was in course, with a pronounced jump in 2013. By contrast, the figures for larger firms follow the overall trend presented earlier. Figure 4.5 might give a first sign that bilateral trade liberalisation between both countries facilitated the export growth and entry of new Peruvian firms into that market, especially the smallest ones.

Figure 4.5



Source: COMEXPERÚ - SUNAT

4.3.2.2 Firm Entry and Exit

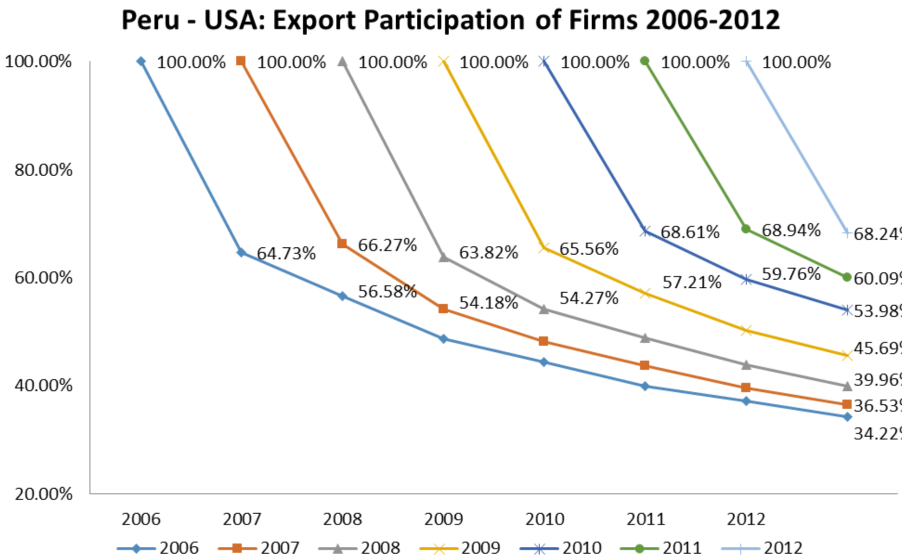
For the subsequent econometric analysis, I reduced the sample to the 2006-2013 time period. I deemed convenient to focus on that period because, after the negotiations to achieve the FTA between Peru and USA finalised in late 2005, some uncertainty remained about the ratification of this treaty by both countries, as well as its implementation from 2009 when the agreement came into force. That uncertainty is more likely to affect firms with less experience in the USA market, with respect to firms with several years selling to that destination. Such difference between newbies and experts is the focus of the subsequent empirical approach.

This sample reduction led to 4,579 Peruvian exporters, 2,371 8-digit tariff lines and 31,311 firm-product pairs. Since some tariff lines did not have available information on actual tariff levels before the enactment of the Free Trade Agreement, they had to be removed from the dataset, also leading to the removal of some firms from the analysis.

With this reduced sample, I made an analysis of the continuity of Peruvian firms in the USA export market. Figure 4.6 indicates that from the 1,914 firms that exported to

USA in 2006, 64.73% (1,239 firms) exported in 2007. Overall, this chart shows that just over 60% of firms that exported to the USA in a particular year do it the year after, which means that over 30% of firms leave the USA market after one year. Hence, attrition levels, although showing a pretty stable pattern, are quite high.

Figure 4.6

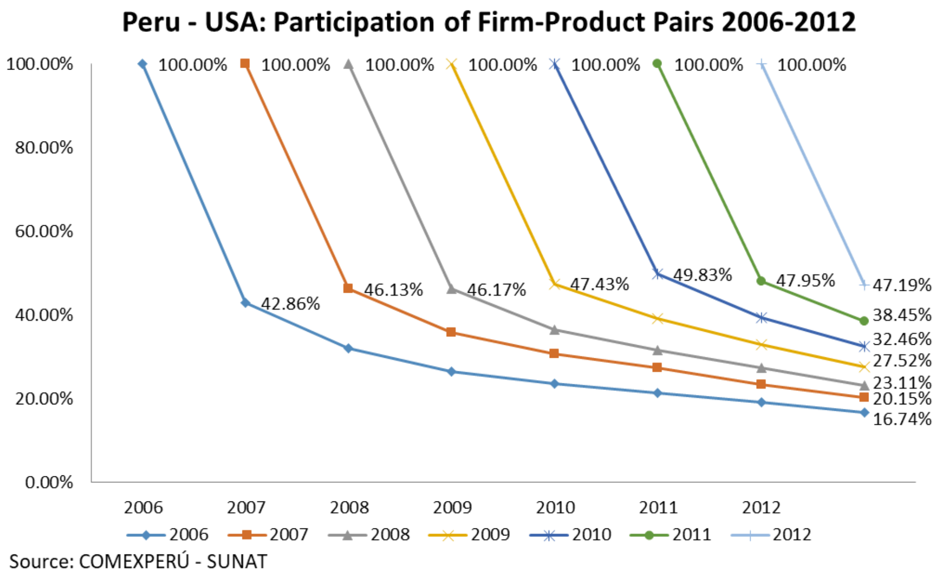


Source: COMEXPERÚ - SUNAT

But a parallel exercise shows that, for example, from the 1,927 firms that exported to USA in 2007, 64.30% (1,239 firms) did it in 2006. In general, between 63% and 76% of firms that exported to USA in a particular year did it the year before. That means that between 24% and 37% of firms each year entered or re-entered into the USA export market. Therefore, these numbers provide an idea of how dynamic this market is in terms of entry and exit.

A similar analysis considered this time the firm-product pairs at the 8-digit level. 62.49% of them are present in the sample only for one year, whereas 15.94% do it for two years. Thus, Figure 4.7 says that over 50% of firm-product pairs present in the USA export market in a year leave it the year after. But a parallel exercise done showed that between 42% and 52% of pairs exporting in a year did it the year before, meaning that from 48% to 58% of pairs that exported in that year were new or re-entrants. Hence, entry and exit dynamics are more evident at the firm-product-pair level.

Figure 4.7



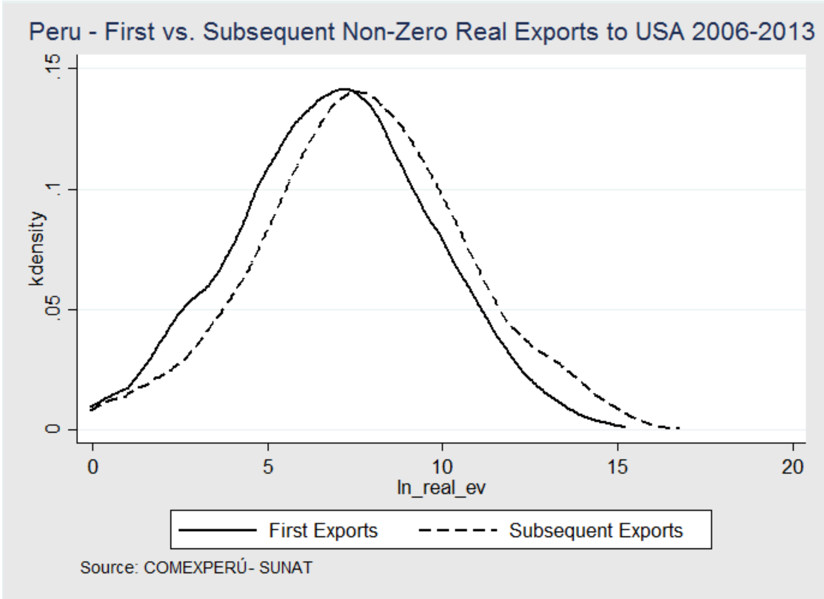
4.3.2.3 First vs. Subsequent Exports

Since the focus of this paper is to analyse the dynamics of genuinely new exporters, in my empirical approach I restrict even more my sample, considering only those firms that began exporting to the USA market since 2006. Thus, I can more appropriately analyse the export dynamics differences between firms with only one-year experience in the USA market and more experienced exporters in that destination. In other words, I disregard the firms with prior experience in that destination and those that re-entered that market from 2006 onwards. That process is facilitated by the firm-transaction data availability dating back to 1993. As a result, in my estimations I work with a final "non-re-entrants" sample of 2,720 firms, 1,579 8-digit tariff lines and 12,074 firm-product pairs.

With this final dataset, I constructed some Kernel density graphs, addressing the difference in export values between the first exports made by Peruvian firms and their subsequent shipments into USA.

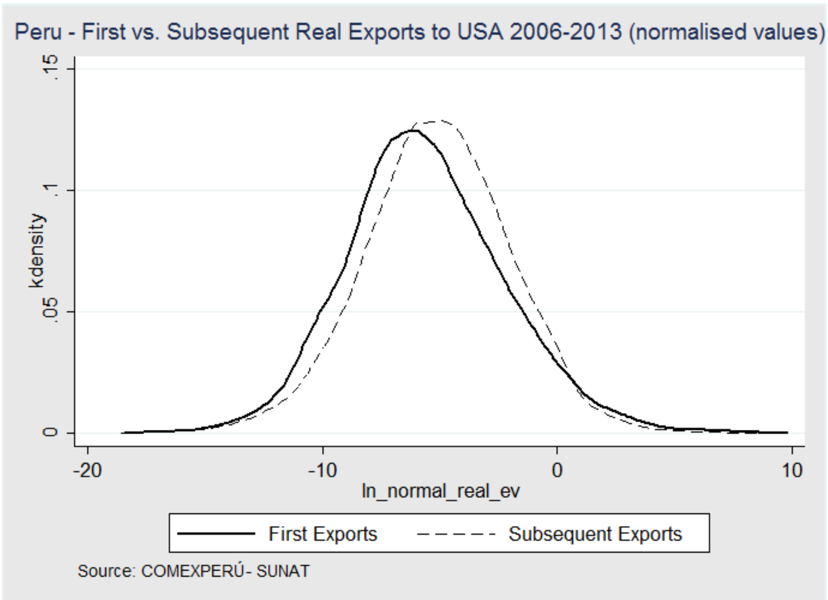
Figure 4.8 compares the densities between the values of the first non-zero real exports to USA per firm-product pair at the 8-digit level and the subsequent ones. Clearly, the subsequent export values tend to be greater than the initial shipments, as the theoretical model implies. The latter achieve a mean of US$ 28,283.14; whereas the former are on average US$ 95,766.40.

Figure 4.8



In order to confirm that tendency, I normalised the export values per firm-product pair by employing the total sum of real exports of product j to USA in 2013, the final year of the dataset. The outcome is shown in Figure 4.9, with the non-zero normalised values, confirming that subsequent real exports to USA tend to be larger than the first ones.[30]

Figure 4.9

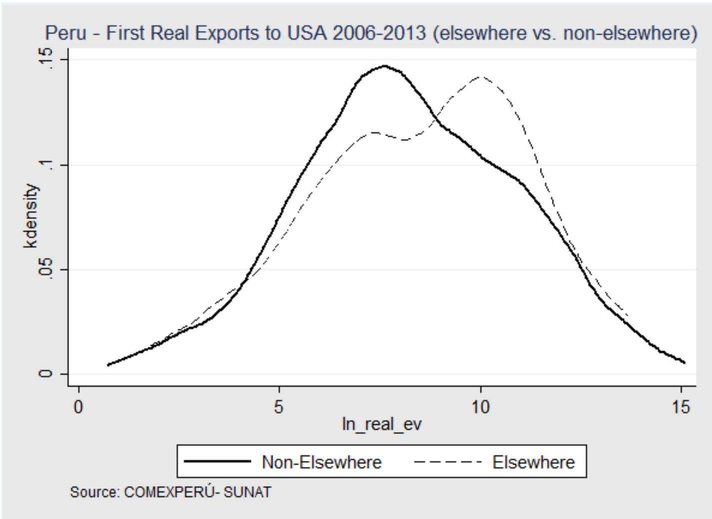


I argue in my empirical approach that there might be differences in the export performance of Peruvian firms in the USA market, depending on whether they have previously

[30]The mean of normalised first real exports is 9.39; while that for further shipments is 2.57. However, the initial exports have a much larger standard deviation of 287.03 than that for further values (85.63).

exported product j to another destination. Figure 4.10 displays an exercise for the log of the first real exports by firms of product j, distinguishing whether such product was exported elsewhere in $t-1$ or not. The distributions are clearly different, and even though the first exports for the "non-elsewhere" firms have a larger mean (US$ 70,480 against US$ 58,056), the first exports of the "elsewhere" firms have a larger 50% percentile, and a lower dispersion.

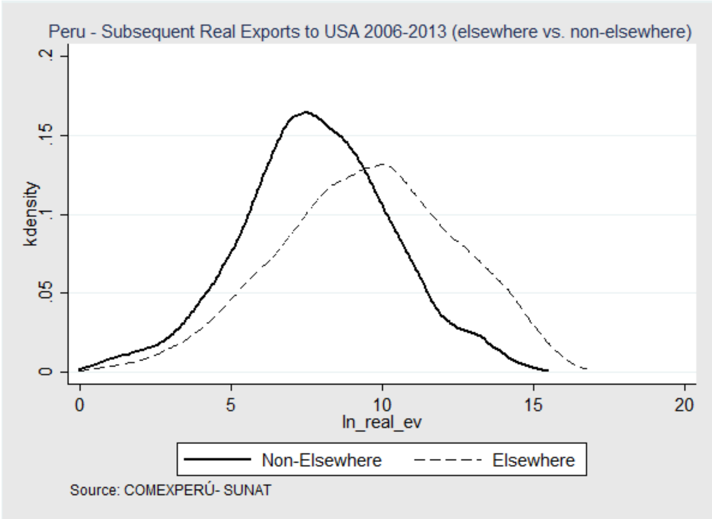
Figure 4.10



When it comes to analysing the subsequent exports, however, the figures change, as Figure 4.11 suggests. If firm i exported product j elsewhere in $t-1$, it tends to send larger shipments to USA in t than those firms not exporting to anywhere else. Both means and medians are much larger for the "elsewhere" firms, and their degree of dispersion is greater as well. This outcome might entail that the experience in other destinations is relevant to encourage firms to explore more and more the USA market.[31]

[31] "Non-elsewhere" firms have a mean export value to USA of US$ 46,104.38; "elsewhere" firms, US$ 289,839.70. As for the 50% percentile, the values are US$ 2,366.73 against US$ 14,324.90.

Figure 4.11



4.3.2.4 New vs. Expert Firms

As a first attempt to test the first prediction of the theoretical model, Figure 4.12 compares the export growth of real exports of product j to USA between new firms – those that began exporting to USA in $t-1$– and the incumbent or expert firms in that market. This is a first assessment of the differences between new and expert firms at the *intensive margin*, which shows that the export growth rate for less experienced Peruvian firms in USA tends to be larger than for the incumbents. Furthermore, the distribution for the new firms is more skewed to the left, meaning that their export growth have a positive tendency.

Figure 4.12

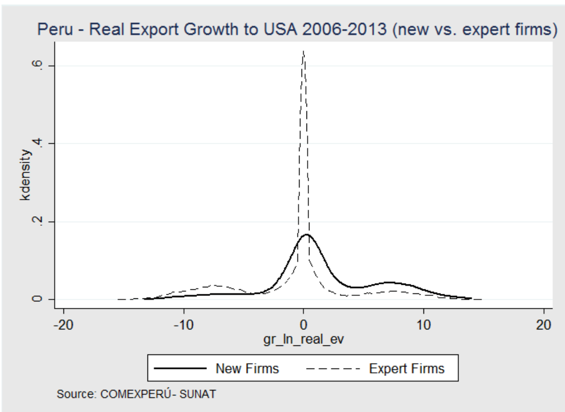
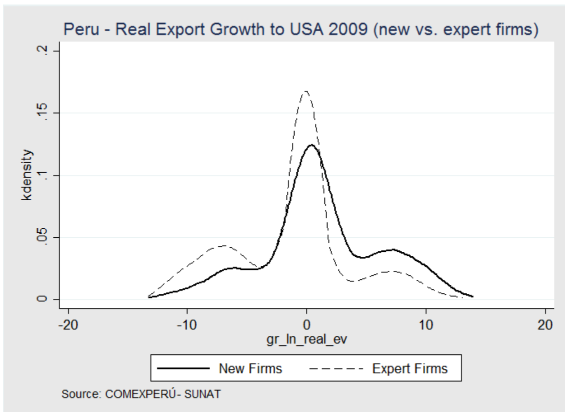


Figure 4.13



But the theory also argues that this difference in export growth between new and expert firms is boosted by trade liberalisation. As a preliminary evidence of that, Figure

4.13 presents the densities of real export growth rates exclusively for 2009, the year most of the tariff eliminations by USA on Peruvian products took place. Clearly, the difference in favour of new firms is much more evident, with a greater frequency of positive export growth rates than for incumbent firms.

4.4 Empirical Approach

Now I present the three econometric models designed for my study on sequential exporting across products, with their respective main results. Each identification seeks to test the three predictions derived from the theory described earlier, on the export dynamics of less experienced firms at the *intensive margin* (Model 1), *extensive margin* (Model 2) and *exit* from an export business (Model 3). The models are tested for the case of Peruvian firms exporting to the United States.

The observations for the three models are defined as a Peruvian firm i exporting a product j to the United States at year t. The analysis considers the 2006-2013 time period, and product j is defined at the 8-digit level. The main results are based upon samples restricted to firms that began exporting to USA from 2006 onwards, also called *non-re-entrants*, in order to facilitate the comparison between one-year experienced firms and firms with longer presence in the USA market.

4.4.1 Model 1: Intensive Margin (Export Growth)

The purpose of this first estimation is to test Prediction 1 on *intensive margin* derived from the theory, which states that, conditional in survival, new firms exporting their first products to a destination experience a greater intensive margin export growth than more expert firms.

The basic specification is presented in Equation 4.1, estimated by a firm Fixed Effects Model, with robust standard errors clustered at the firm level. The dependent variable $\Delta ln\_real\_ev_{ijt}$ is the change in the log of firm i's real exports of product j in year t. It is regressed on a binary variable $new\_USA_{i,t-1}$ taking value 1 if that firm exported to the USA market for the first time in year $t-1$. This dummy was defined to control for the condition of firms having an overall one-year experience in the USA market, as well as the condition of product j being the first product exported to that destination.

$$\begin{aligned}\Delta ln\_real\_ev_{ijt} = \alpha_0 + \alpha_1 new\_USA_{i,t-1} + \alpha_2 fta_{jt} + \\ \alpha_3 newUSA * lag2else_{ijt} + \alpha_4 fta * new\_USA_{ijt} + \\ \alpha_5 lag1\_core50_{ijt} + \alpha_6 newUSA * lag1core50_{ijt} + \mu_{ijt}.\end{aligned} \tag{4.1}$$

This effect on export growth might be enhanced by the existence of the Free Trade Agreement between Peru and USA since 2009. To account for that, I include a variable accounting for this trade liberalisation process, named fta_{jt}, which represents the change in log of unity plus the proportional tariff levied by the United States to product j (8-digit tariff line), from $t-1$ to t. This variable is included on its own and interacted with the dummy controlling for one-year experienced exporters in the USA market, denoted as $fta * new\_USA_{ijt}$. The outcome I expect from these variables is a negative sign, since my initial hypothesis is that a reduction in tariff rates in the USA market facilitates the export performance of Peruvian firms in product j, especially the newcomers.

It is important to stress that fta_{jt} is also useful to disentangle the effects of trade liberalisation from the effects of the economic crisis that lowered Peruvian exports in 2009, the same year the USA-Peru FTA came into force.

Although the main focus is the bilateral trade relation between Peruvian firms and the United States, it is also necessary to consider the rest of markets firm i trades with and how it might influence its performance at the market of interest. For that reason, I include the variable $newUSA * lag2else_{ijt}$, the interaction between $new\_USA_{i,t-1}$ and the dummy $lag2else$, which takes value 1 if firm i exported product j to any other destination in $t-2$, and zero otherwise. The idea behind this interaction is to illustrate the case of a Peruvian firm that previously exported j elsewhere in $t-2$, then exporting it sequentially to the USA market in $t-1$, in order to test whether having exported elsewhere in the past has an extra effect on new exporters in the United States.

The model addresses the differences across products ("core competence" vs. the rest) by the inclusion of the last two variables. $lag1\_core50_{ijt}$ takes value 1 if product j accounted for a minimum of 50% of firm i's total exports to the world in $t-1$.[32] In other words, this variable controls for products belonging to firm i's core competences in the previous year. $lag1\_core50_{ijt}$ is included on its own and interacted with $new\_USA_{i,t-1}$. Since my theoretical approach predicts that the firm, particularly a one-year experienced one, will

[32] This criterion is an approximation to what the theory considers as less costly products, given that I do not count on firms' actual cost data.

have a greater export growth over time with a non-core product, I expect a negative sign for both variables. Thus, growth at the intensive margin is higher if a firm exports a non-core product, compared to a core one.

Apart from controlling for firm fixed effects as mentioned earlier, the model is enriched with the inclusion of fixed effects at different levels. Year dummies control for particular demand shocks occurring in a specific year, like 2008 and 2009 when the recent economic crisis in USA and Europe took place. The reference year is 2006, the beginning of the sample. Besides, I take into account the issue that many products exported to the United States were previously liberalised by the ATPDEA unilateral liberalisation or enjoyed a 0% tariff from the Most-Favoured-Nation scheme, even before the enactment of the FTA. Regarding sector fixed effects, dummies accounting for the industry each product belongs to are added as well. Recall I work with eight different sectors, and the reference for this analysis is agriculture.

It is also feasible that export growth of product j by firm i in the USA market is influenced by firm i's export performance in the previous year. That is why I incorporate in further estimations the log of firm i's overall real exports to USA in year $t-1$, $lag\_ln\_real\_ev\_USA\_tot_i$, the sign of which I expect it to be negative because it is arguable that larger exports to USA imply that the firm is close to its equilibrium level of exports.

It is necessary to mention that for this first model, working on export growth, the sample is restricted to firms that exported a product to USA for at least two consecutive years.

4.4.1.1 Main Results

Table 4.3 reports the main results from Model 1 on the *intensive margin*. The basic specification from Equation 4.1 is presented in Column (1), while Columns (2)-(4) test the robustness of this main estimation by adding further interactions with the tariff change variable. Additionally, Columns (3)-(4) exclude the $newUSA * lag2else_{ijt}$ variable to compare the significance of the main variables of interest.

These first estimations confirm the positive and significant association between the condition of being a one-year experienced Peruvian firm in the USA market, exporting its first products to that market, and the intensive margin export growth. However, that positive relation is eliminated if such new firm has also been exporting the same product j to any other destination, according to the negative and significant coefficients of $newUSA * lag2else_{ijt}$.[33]

Table 4.3: Model 1 - Intensive Margin

Dependent Variable	Δln_real_ev							
Estimation	Firm FE Robust							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
new_USA	2.254***	2.282***	2.091***	2.090***	1.220***	1.222***	1.130***	1.130***
	(0.260)	(0.260)	(0.259)	(0.258)	(0.233)	(0.231)	(0.227)	(0.227)
newUSA*lag2else	-2.415***	-2.402***			-0.932***	-0.931**		
	(0.435)	(0.436)			(0.360)	(0.361)		
lag1_core50	-4.061***	-4.068***	-3.997***	-4.009***	-2.195***	-2.196***	-2.165***	-2.165***
	(0.201)	(0.201)	(0.201)	(0.204)	(0.155)	(0.155)	(0.154)	(0.158)
newUSA*lag1core50	0.417	0.309	-0.0533	-0.0424	0.203	0.194	0.0587	0.0588
	(0.340)	(0.346)	(0.359)	(0.359)	(0.295)	(0.299)	(0.296)	(0.298)
fta	-4.758*	-4.773*	-4.734*	-4.501	-3.099	-3.099	-3.027	-3.026
	(2.698)	(2.698)	(2.707)	(2.865)	(2.406)	(2.407)	(2.410)	(2.506)
fta*new_USA	7.304	9.053*	10.02*	9.783*	3.248	3.391	3.653	3.652
	(4.792)	(5.408)	(5.431)	(5.497)	(4.046)	(4.619)	(4.577)	(4.619)
fta*lag1core50				-1.941				-0.00585
				(5.215)				(4.088)
ftanewUSA*lag1core50		-8.938	-10.03	-8.083		-0.727	-1.096	-1.091
		(6.336)	(6.280)	(7.980)		(5.848)	(5.784)	(7.025)
lag_ln_real_ev_USA_tot					-0.554***	-0.554***	-0.555***	-0.555***
					(0.0209)	(0.0210)	(0.0210)	(0.0210)
Year FE	No	No	No	No	Yes	Yes	Yes	Yes
Sector FE	No	No	No	No	Yes	Yes	Yes	Yes
ATPDEA and MFN dummies	No	No	No	No	Yes	Yes	Yes	Yes
N	17077	17077	17077	17077	17077	17077	17077	17077
r2_o	0.0331	0.0331	0.0329	0.0329	0.164	0.164	0.164	0.164
N_clust	1000	1000	1000	1000	1000	1000	1000	1000

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

When it comes to the condition of "core competences" by product j, represented by the $lag1\_core50_{ijt}$ dummy and its interaction with $new\_USA_{i,t-1}$, the negative and significant estimates of the former convey that the export growth to USA of products the firm usually performs better at in terms of sales is lower compared to the "non-core

[33]Recall from Figures 4.10 and 4.11 that firms that exported product j elsewhere in $t-1$ tend to export larger volumes to USA. Hence, it is expectable that growth rates between these volumes are not as large as rates for firms which experiment with product j only in USA.

competence" products, just like the theoretical model predicts. This effect holds for both new and incumbent Peruvian firms in the USA market and, given the insignificance of the $newUSA * lag1core50_{ijt}$ interaction, there does not seem to be an outstanding difference in that effect between both types of firms.

Regarding the variables controlling for trade liberalisation, the tariff growth rate fta_{jt} and its interaction with the "new exporter to USA" dummy, the estimates attained are not significant; but exhibit a positive sign that differs from the theory's implications, which might entail that trade liberalisation is not so determinant for the intensive margin. This result might imply that the export growth is explained by other factors apart from the $\frac{\tau}{2}$ obtained from the theoretical model. Among those, I can think of the ability of some firms, particularly the incumbents, to anticipate the liberalisation process in their export decisions, making them adjust their overall cost structure and make the most of the tariff elimination by raising their export levels.

Columns (5)-(8) show the results when additionally controlling for the firm's past performance in the USA market, time and sector fixed effects and the ATPDEA and MFN dummies, all included at once because thus the main variables of interest obtain less overestimated and more reliable results. Indeed, the condition of "new exporter" maintains the positive effect on the export growth, but to a lower extent. The same can be argued for the estimates for the role of having exported product j elsewhere and the past "core competence" condition of such product. The negative coefficients for $lag\_ln\_real\_ev\_USA\_tot_i$ imply that the better the firm did in $t-1$ in terms of export sales to USA, the lower the export growth for product j to that market, which makes sense, as it provides the idea that a firm might be close to their equilibrium value of exports to USA in $t-1$. Hence, the export growth in t does not need to be so large.

4.4.2 Model 2: Extensive Margin (Entry)

Through this second estimation on the extensive margin, I test Prediction 2 from the theory, which states that, conditional on survival, new firms in the USA market are more likely to export new products to that destination than more experienced firms.

Applying a Linear Probability Model with firm fixed effects and standard errors clustered at the firm level, the dependent variable for this regression, expressed in Equation 4.2, is denoted as $Entry_{ijt}$. That is a binary variable taking value 1 if firm i exported product j for the first time to the United States in year t, and 0 otherwise. That dummy is regressed on the known binary variable, $new\_USA_{i,t-1}$, taking value 1 if the firm entered the US market for the first time in year $t-1$. Such variable again controls for new Peruvian exporters to USA, and it is expected to obtain a positive coefficient, since new exporters have more unexploited opportunities to follow up.

$$\begin{aligned} Pr[Entry_{ijt}=1] = \beta_0 + \beta_1 new\_USA_{i,t-1} + \beta_2 fta_{jt} + \beta_3 fta * new\_USA_{ijt} + \\ \beta_4 similar\_prod_{ij,t-1} + \beta_5 newUSA * lag1else_{ijt} + \\ \beta_6 core50_{ijt} + \beta_7 newUSA * core50_{ijt} + \mu_{ijt}. \end{aligned} \tag{4.2}$$

The effect of trade liberalisation is controlled for by the fta_{jt} variable described earlier, adding it on its own and interacting it with the dummy of new exporter in the USA market. Given the implications from the theory, I expect a negative coefficient for the tariff change variable, making the entry probability with a new product higher for all firms. However, for $fta * new\_USA_{ijt}$, I would expect a positive sign, since Prediction 2 states that the increment in the entry probability is larger for the incumbent firms, for which it would be easier to export a liberalised product than for newcomers.

My extensive margin prediction is affected by the positive but imperfect correlation of the unknown export profitability μ^N across products. Such correlation can be interpreted as similarities across products, in terms of demand and supply patterns. In that sense, I incorporate the $similar\_prod_{ij,t-1}$ dummy, which takes value 1 if firm i exported to USA in $t-1$ at least one product belonging to the same 4-digit HS tariff group as the product j the firm exports in t. I expect a positive sign for that variable, as a firm that had a previous experience in $t-1$ exporting to USA a product from a particular tariff group would be more likely to experiment with a new product from that group. In further estimations, this dummy is interacted with the variables accounting for new exporters and trade liberalisation. The expected signs for these interactions are uncertain since the theory predicts that the effect of positive correlation depends on the firm's expected export profitabilities with respect to the known costs.

I also need to control for "core competence" products, by including the $core50_{ijt}$ dummy and its interaction with the new exporters dummy, $newUSA * core50_{ijt}$. Unlike Model 1, this time I use the level of $core50$, which takes value 1 if product j accounts for 50% or more of firm i's total exports in year t. For that dummy and its interaction, I expect, according to the prediction, a positive coefficient, as firms tend to experiment with a new product for which known production costs are lower; feature that is approximated by higher overall export sales.

As an additional covariate to control for the firm's experience in other destinations, I incorporate the interaction $newUSA * lag1else_{ijt}$, similar to that from Model 1; but now $new\_USA_{i,t-1}$ is interacted with the $lag1else$ dummy, taking value 1 if firm i exported product j to another market in $t-1$. My hypothesised sign is positive for this variable, as I can argue that a firm that exported a product to a previous destination, once in the US market will experiment there with that same product.

The entry into the USA market with a new product might be also influenced by the performance of other firms in the Peruvian industry in the previous year. For that reason, inspired in Albornoz et al. (2012), in further estimations I include $ln\_lag\_n\_sec\_exp\_USA_t$, the number of exporters to the United States in year $t-1$ from the sector the product belongs to, as well as the growth of the log of exports from that sector to USA in year t, $gr\_ln\_real\_sector\_USA\_exports_t$. Like in Model 1, the log of exports by firm i to the US in $t-1$ is added in some specifications. Year, sector and product fixed effects are also included.

Once again, the sample is restricted to firms exporting to USA for at least two years. However, since I am interested in the entry into the business of a particular product, once that product is introduced by firm i in year t, the firm-product pair is dropped from the sample from year $t+1$ onwards.

4.4.2.1 Main Results

Table 4.4 reports the main results from Model 2 on the extensive margin. The basic regression is shown in Column (1), while Columns (2)-(4) check the robustness of this first estimation controlling for further interactions involving fta_{jt} and $similar\_prod_{ij,t-1}$. Columns (5)-(8) replicate the exercise, adding controllers on the size of product j's sector.

A Peruvian firm with only one year of experience in the US market is more likely to export a new product j to that country in t than a more consolidated exporter, according the positive and significant estimates for $new\_USA_{i,t-1}$ across all the specifications. These numbers match the second prediction of the theoretical framework. Such positive effect is clearly boosted if that new exporter has exported product j elsewhere in $t-1$.

Table 4.4: Model 2 - Extensive Margin (Entry)

Dependent Variable	Entry_ijt							
Estimation	LPM							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
new_USA	0.174***	0.174***	0.196***	0.196***	0.171***	0.171***	0.193***	0.193***
	(0.0353)	(0.0354)	(0.0371)	(0.0371)	(0.0353)	(0.0354)	(0.0372)	(0.0372)
newUSA*lag1else	0.0861**	0.0870**	0.107***	0.107***	0.0866**	0.0875**	0.108***	0.108***
	(0.0376)	(0.0375)	(0.0367)	(0.0367)	(0.0375)	(0.0375)	(0.0366)	(0.0366)
core50	0.541***	0.542***	0.553***	0.552***	0.539***	0.539***	0.551***	0.550***
	(0.0195)	(0.0200)	(0.0191)	(0.0186)	(0.0195)	(0.0201)	(0.0192)	(0.0186)
newUSA*core50	-0.112**	-0.100**	-0.00700	-0.00605	-0.111**	-0.0993**	-0.00619	-0.00538
	(0.0445)	(0.0461)	(0.0459)	(0.0456)	(0.0444)	(0.0460)	(0.0458)	(0.0456)
fta	-0.682***	-0.686***	-0.810***	-0.800***	-0.572***	-0.575***	-0.698***	-0.690***
	(0.211)	(0.217)	(0.235)	(0.228)	(0.211)	(0.217)	(0.235)	(0.228)
fta*new_USA	1.341***	1.309***	1.215**	1.204**	1.312***	1.278***	1.190**	1.181**
	(0.441)	(0.447)	(0.496)	(0.492)	(0.439)	(0.445)	(0.494)	(0.490)
fta*core50		0.0831	0.183			0.0544	0.154	
		(0.466)	(0.472)			(0.467)	(0.473)	
ftanewUSA*core50		1.733	1.984	2.167		1.755	2.006	2.160
		(1.673)	(1.431)	(1.341)		(1.662)	(1.424)	(1.333)
similar_prod	0.217***	0.217***	0.336***	0.336***	0.214***	0.214***	0.332***	0.332***
	(0.0202)	(0.0202)	(0.0275)	(0.0275)	(0.0204)	(0.0204)	(0.0277)	(0.0277)
newUSA*similar			-0.241***	-0.241***			-0.240***	-0.240***
			(0.0399)	(0.0399)			(0.0398)	(0.0398)
core50*similar			-0.303***	-0.302***			-0.302***	-0.302***
			(0.0579)	(0.0579)			(0.0580)	(0.0580)
fta*similar			1.579***	1.572***			1.564***	1.557***
			(0.457)	(0.456)			(0.460)	(0.458)
ftanewUSA*similar			-1.098*	-1.091			-1.109*	-1.102*
			(0.667)	(0.665)			(0.667)	(0.666)
ln_lag_n_sec_exp_USA					0.0445***	0.0445***	0.0429***	0.0430***
					(0.00717)	(0.00716)	(0.00719)	(0.00719)
gr_ln_real_sector_USA_exports					-0.0340**	-0.0340**	-0.0341**	-0.0341**
					(0.0153)	(0.0153)	(0.0153)	(0.0154)
N	28488	28488	28488	28488	28488	28488	28488	28488
r2_o	0.100	0.101	0.107	0.107	0.102	0.102	0.109	0.109
N_clust	1158	1158	1158	1158	1158	1158	1158	1158

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

The hypothesis on the relation between the "core competence" condition of a product and the extensive margin growth is supported by the estimations, since I obtain positive and significant coefficients for the $core50_{ijt}$ dummy. This means that firm i is more likely to export to USA a new product that accounts for a minimum of 50% of its total exports, as a proxy for production efficiency. That effect is also positive for new Peruvian exporters to USA; however, given the negative sign and lower absolute values for the $newUSA{*}core50_{ijt}$ interaction, such effect for new firms is not as large as for more consolidated exporters.

The variables controlling for trade liberalisation provide results that are consistent with the implications from the theory. A tariff elimination by USA on Peruvian products is linked with an increase in the entry probability by a firm into that market with product j, according to the negative and significant coefficients for fta_{jt} across all specifications. However, that rise in the entry probability is more than offset for newcomers, compared to the most established firms in the USA market. That is represented by the positive and significant values for $fta * new\_USA_{ijt}$, which is larger in absolute value, meaning that new Peruvian exporters are at a disadvantage relative to the incumbents in the USA market at the extensive margin, presumably due to a larger degree of competition from liberalisation. The latter gives certain support to Prediction 2, which states that the increase in the entry probability with trade liberalisation is larger for expert firms. Regarding the $fta * core50$ and $ftanewUSA * core50$ interactions, there seems not to be differences in the liberalisation effect between core and non-core products.

The positive and imperfect correlation across products, understood as similarities across goods, is accounted for by the $similar\_prod_{ij,t-1}$ dummy, which is positive and significant in all the regressions, supporting my initial expectations. Hence, firms tend to undertake a *sequential exporting* strategy with products that belong to a common 4-digit tariff group. The interactions of that dummy provide interesting results. The interaction with $new\_USA_{i,t-1}$ gives negative and significant numbers with lower absolute value, meaning that the effect of having previously exported a similar product to USA is greater for an incumbent firm. These negative signs can also be related to the prediction arising from the case in which $E\mu^{Nj} > 2F_d^{1/2} + \tau^j + c^{pj}$, meaning that new firms tended to export correlated products simultaneously, rather than sequentially.[34] Likewise, the negative and significant values for the interaction between similar products and the $core50_{ijt}$ dummy entail that the "similar" effect might be larger for "non-core competence" products. However, the results for these variables are afterwards compared with further regressions.

More consolidated firms in the USA market are encouraged to diversify their export portfolio with other type of products when liberalisation occurs. That is expressed by

[34] Recall that in such case, the larger the correlation across products, the greater the cutoff of μ^{NA} above which a firm exports sequentially, meaning that the value of experimentation is lower. Hence, it will be preferred to export simultaneously.

the positive and significant coefficients for the $fta * similar$ interaction. In contrast, the $ftanewUSA * similar$ interaction, through its negative –although less significant– coefficients, indicate that the disadvantage for new firms at the extensive margin in the event of liberalisation is somehow compensated if those firms experiment with a similar product to the one previously exported.

No major changes in the coefficients of interest take place when adding the variables on the size of product j's sector, accounting for competition level. These variables imply that the entry probability with product j is positively associated with the degree of competition in terms of number of exporters to USA from that sector (positive values for $ln\_lag\_n\_sec\_exp\_USA$); while a negative association is attained in terms of the growth of the sectoral export volume (negative coefficients for $gr\_ln\_real\_sector\_USA\_exports$).

Appendix B.1 reports the results from Model 2 when controlling for firm i's past performance in the USA market, time and sector fixed effects and product-specific dummies. The most evident change is the loss of significance for the variables of interest –new exporter and trade liberalisation covariates– when $lag\_ln\_real\_ev\_USA\_tot_i$ is included. This variable, controlling for exports to USA in $t-1$, always provides positive coefficients, meaning that the more a firm exports to USA, the more likely it is to experiment in the future with new products. This outcome implies that the past performance plays a determinant role in Peruvian firms' export decisions in both the intensive and extensive margin.

There is another relevant and striking change when these additional controllers are included. The $newUSA*similar$ interaction, which was negative and significant in the main results, now turns positive and significant in most regressions. That difference between results can be interpreted as follows: a large export value to USA by a firm can be arguably associated with the number of products it exports to that market. From my dataset, I can identify that larger exporters with more years in the USA market, have already sold many products from the same tariff group in the past. In contrast, less experienced firms, tending to start with fewer products and lower values, might be more likely to continue experimentation with a product from the same 4-digit tariff group as those exported to USA last year.

4.4.3 Model 3: Exit from a Market

The last model I present was designed to test Prediction 3, which states that new firms in the USA market are more likely than more consolidated exporters to stop exporting a particular product to that country; and that such probability is reduced by trade liberalisation, and is also lower for core competence products.

Another Linear Probability Model with firm fixed effects and standard errors clustered at the firm level is estimated, the basic specification of which is expressed in Equation 4.3). The dependent variable, denoted as $Exit_{ijt}$, is a binary variable that takes value 1 if firm i stops exporting product j to the United States in year t, and 0 otherwise.

$$\begin{aligned} Pr[Exit_{ijt}=1] = \gamma_0 + \gamma_1 new\_USA_{i,t-1} + \gamma_2 fta_{jt} + \\ \gamma_3 fta * new\_USA_{ijt} + \gamma_4 newUSA * lag1else_{ijt} + \\ \gamma_5 core50_{ijt} + \gamma_6 newUSA * core50_{ijt} + \mu_{ijt}. \end{aligned} \tag{4.3}$$

That dummy is regressed on the $new\_USA_{i,t-1}$ binary variable defined in Model 1, controlling for the entry of firm i into the USA market in year $t-1$ with product j. The variable accounting for the USA trade liberalisation in 2009 is included on its own, and interacted with $new\_USA_{i,t-1}$. I expect a positive coefficient for the dummy on new exporters to USA. For the liberalisation variables, I also expect positive signs, because the theoretical framework predicts that a tariff reduction diminishes the exit likelihood by firms, especially the less experienced ones, from the business of exporting product j to destination d.

Like in the previous models, I control for the firm's performance in other destinations by incorporating the aforementioned $newUSA * lag1else_{ijt}$, for which I expect a negative sign, meaning that a new exporter to USA is less likely to stop exporting product j to that market if it previously exported that good elsewhere.

Regarding the role of production costs, I again try to approximate their effect by using the $core50_{ijt}$ dummy on its own and interacted with $new\_USA_{i,t-1}$. Following the theory, I expect both variables to provide negative coefficients, meaning that a core competence product makes the firm's exit probability lower, especially for new firms in the USA market. For reasons I will explain when presenting the results, I experiment by using these variables both contemporaneously ($core50_{ijt}$) and in lags ($lag1\_core50_{ijt}$), like I used in the *intensive margin* model.

Aiming to control for firm i's past performance in the USA market, I include in some specifications the variable $lag\_ln\_real\_ev_{ijt}$, which represents the log of the real export value of product j by firm i to the United States in $t-1$. Fixed effects utilised in the previous models are included, as well as the ATPDEA and MFN dummies.

For this third estimation, all exporters to USA from 2006 to 2013 are considered, with no restriction on the number of years they have exported within the sample. As I am interested in the transition from exporting to not exporting, observations with zero exports per firm-product pair before the first non-zero export are dropped, as well as those after the year the $Exit_{ijt}$ dummy becomes 1.

4.4.3.1 Main Results

Table 4.5 displays the main results from this model. The basic specification from Equation 4.3 is presented in Column (1), while the next two columns incorporate some interactions with the tariff change variable. Columns (4)-(6) mirror those estimations, but additionally control for the lag of firm i's export of product j to USA, year, sector, ATPDEA and MFN dummies.

These specifications indicate that a Peruvian firm with only one year of experience in the USA market, exporting their first products in $t-1$, is more likely to stop exporting product j to that country in year t, compared to the incumbent exporters. This is shown by the positive and highly significant coefficients for $new\_USA_{i,t-1}$. That exit probability tends to diminish if that new firm previously exported product j to another market in $t-1$, given the negative values for the $newUSA * lag1else_{ijt}$ interaction, which are significant in Columns (4)-(6).

Table 4.5: Model 3 - Exit - controlling for core products in year t

Dependent Variable	Exit_ijt					
Estimation	LPM					
Column	(1)	(2)	(3)	(4)	(5)	(6)
new_USA	0.172***	0.173***	0.173***	0.186***	0.187***	0.187***
	(0.0245)	(0.0246)	(0.0246)	(0.0173)	(0.0173)	(0.0173)
newUSA*lag1else	0.00185	0.00212	0.00215	-0.0699***	-0.0698***	-0.0698***
	(0.0314)	(0.0313)	(0.0314)	(0.0212)	(0.0211)	(0.0211)
core50	-0.510***	-0.511***	-0.515***	-0.343***	-0.343***	-0.343***
	(0.0120)	(0.0120)	(0.0120)	(0.0115)	(0.0115)	(0.0117)
newUSA*core50	-0.0482*	-0.0604**	-0.0573**	-0.160***	-0.165***	-0.166***
	(0.0285)	(0.0288)	(0.0288)	(0.0224)	(0.0228)	(0.0228)
fta	0.228	0.227	0.301	-0.222	-0.222	-0.228
	(0.263)	(0.263)	(0.289)	(0.173)	(0.173)	(0.184)
fta*new_USA	0.589	0.711	0.634	0.704***	0.757***	0.763***
	(0.430)	(0.455)	(0.469)	(0.269)	(0.282)	(0.290)
fta*core50			-0.613*			0.0491
			(0.357)			(0.284)
ftanewUSA*core50		-1.219**	-0.607		-0.495	-0.544
		(0.525)	(0.629)		(0.448)	(0.526)
lag_ln_real_ev				0.0491***	0.0491***	0.0491***
				(0.00163)	(0.00163)	(0.00163)
Year FE	No	No	No	Yes	Yes	Yes
Sector FE	No	No	No	Yes	Yes	Yes
ATPDEA and MFN dummies	No	No	No	Yes	Yes	Yes
N	31882	31882	31882	27434	27434	27434
r2_o	0.0986	0.0986	0.131	0.246	0.246	0.246
N_clust	2599	2599	2599	2599	2599	2599

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

The negative and significant estimates for the variables controlling for core products inform us that the firm is more likely to remain exporting a product if it was one of the firm's core competences in year t. There is an additional factor reducing the exit effect of $core50_{ijt}$ for new firms, identified from the negative and significant values for the $newUSA * core50$ interaction.

Regarding the liberalisation variables, the tariff change on its own does not seem to represent any effect on the exit likelihood. However, it does represent an effect for newcomers, because the positive and significant coefficients for $fta * new\_USA_{ijt}$ in Columns (4)-(6) report that the tariff elimination by USA in 2009 reduced the new firms' probability of stopping the export of product j to that market. The interactions of trade liberalisation with the $core50_{ijt}$ dummy do not provide quite significant effects.

When controlling for firm i's past performance and the other fixed effects, few changes to the variables of interest occur. The positive and significant values for the firm's export value of product j in $t-1$ might be an indicator that the more of j the firm exported in the past, the more ready it is to export other products.

Appendix B.1 contains six additional regressions for Model 3. The first three columns show results controlling for MFN and ATPDEA dummies, along with time and sector fixed effects; while the other three only add the lag of the export value of product j. No major differences from the main regressions are perceived, except that the robustness of the main conclusions for the variables of interest is strengthened by the inclusion of $lag\_ln\_real\_ev_{ijt}$.

Since the "core competence" condition of a product may vary over time, I considered it informative to make an experiment, shown in Appendix B.1, which replace the level of the "core50" condition with its first lag, $lag1\_core50_{ijt}$, including the $newUSA * lag1core50_{ijt}$ interaction. The patterns followed by the main variables of interest remain unchanged. Moreover, $fta * new\_USA_{ijt}$ and $newUSA * lag1else_{ijt}$ exhibit a greater significance across regressions. However, the fall in the exit likelihood for products that account for 50% or more of the firm's total exports is not so evident when controlling for "core competence" products in $t-1$. Without including the lag of the firm's export value of product j, the $lag1\_core50_{ijt}$ variable and its interaction with $new\_USA_{i,t-1}$ obtain positive and significant values. But when controlling for firm i's past performance, although $lag1\_core50_{ijt}$ reports negative estimates like in Table 4.5; the $newUSA * lag1core50$ interaction again gives positive coefficients.[35]

4.5 Robustness Checks

In this section, I summarise the main results from the robustness checks run for the three models developed, mainly focusing on alternatives to control for core competence products, and how this "core competence" effect on the export growth, entry and exit differs across firm sizes.

[35] The sign change for $lag1\_core50_{ijt}$ when including the lag of exports of product j to USA makes sense, as the "core competence" condition of product j in $t-1$ might partly be explained by the amount of that good exported to USA in that year.

4.5.1 Interactions between Core Products and Firm Size

One first attempt is to interact the original $core50$ dummy with binary variables accounting for firm size, proxied by the mean total annual exports of firms between 1998 and 2013, in order to determine whether there are differences in the effect of "core competence" products across sizes. In the previous descriptive analysis, I distinguished four size categories described in Table 4.2, from which the *very small firms* is the base category. These dummies are also interacted with the previously constructed interaction between $core50$ and the new_USA variable. I should recognise, however, that the firm size approximation I am employing may lead to an endogeneity problem, since the firm size is determined by its exports, and I do not count on data on domestic output and number of employees. Nevertheless, one way to attenuate this issue is to use, as described earlier, the firms' mean annual exports to everywhere during a longer time span (1998-2013).

For Model 1 on the *intensive margin*, as can be recalled, I used the first lag of that $core50$ dummy to assess if the "core competence" condition of product j in $t-1$ had an effect on the export growth in time t. Table 4.6 presents the results of this robustness check, which does not lead to major changes for the main variables of interest. In fact, $new\_USA_{i,t-1}$ conserves its positive and significant values; while the tariff change from 2008 to 2009 still shows negative but rarely significant coefficients.

Regarding the results for $lag1\_core50$ and its interaction with $new\_USA_{i,t-1}$, the negative and significant values for the former and the significantly positive numbers for the latter confirm what the main estimations showed, matching the prediction from the theoretical analysis: export growth rates are bigger for "non-core competence" products. That effect holds for both new and expert firms; but tends to be larger for the latter.

The incorporation of the firm size provides an interesting outcome: this positive effect for non-core products tend to fade out the larger the firm is in terms of export sales. That is derived from the positive and significant numbers for the interactions with firm size, implying that the effect of non-core products, as an approximation of more costly products, on the intensive margin is more relevant for the smallest firms.

Table 4.6: Model 1 - Intensive Margin, including interactions between lag1_core50 and firm size

Dependent Variable	Δln_real_ev							
Estimation	Firm FE Robust							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
new_USA	2.261***	2.285***	2.090***	2.088***	1.203***	1.199***	1.113***	1.112***
	(0.261)	(0.261)	(0.259)	(0.259)	(0.232)	(0.230)	(0.226)	(0.226)
fta	-4.828*	-4.839*	-4.809*	-4.478	-3.086	-3.086	-3.011	-2.888
	(2.683)	(2.682)	(2.693)	(2.855)	(2.400)	(2.400)	(2.403)	(2.504)
fta*new_USA	7.519	9.031*	10.03*	9.691*	3.678	3.439	3.672	3.549
	(4.776)	(5.411)	(5.432)	(5.502)	(4.047)	(4.611)	(4.572)	(4.614)
newUSA*lag2else	-2.458***	-2.446***			-0.844**	-0.845**		
	(0.436)	(0.437)			(0.366)	(0.367)		
lag1_core50	-6.171***	-6.172***	-6.155***	-6.167***	-3.769***	-3.768***	-3.759***	-3.763***
	(0.333)	(0.334)	(0.335)	(0.337)	(0.257)	(0.257)	(0.257)	(0.258)
lag1core50*small	1.879***	1.874***	1.939***	1.926***	1.282***	1.283***	1.305***	1.300***
	(0.472)	(0.472)	(0.474)	(0.477)	(0.340)	(0.340)	(0.340)	(0.343)
lag1core50*medium	3.307***	3.299***	3.331***	3.333***	2.816***	2.817***	2.828***	2.828***
	(0.509)	(0.509)	(0.510)	(0.510)	(0.360)	(0.360)	(0.360)	(0.360)
lag1core50*large	4.721***	4.720***	4.807***	4.809***	2.867***	2.867***	2.894***	2.895***
	(0.542)	(0.542)	(0.546)	(0.546)	(0.400)	(0.400)	(0.401)	(0.401)
newUSA*lag1core50	1.139**	1.070**	1.006**	1.019**	1.191***	1.202***	1.188***	1.193***
	(0.473)	(0.476)	(0.487)	(0.488)	(0.417)	(0.418)	(0.420)	(0.421)
newUSA*lag1core50*small	-0.131	-0.194	-0.483	-0.471	-0.112	-0.102	-0.206	-0.202
	(0.563)	(0.565)	(0.585)	(0.586)	(0.508)	(0.509)	(0.515)	(0.516)
newUSA*lag1core50*medium	-1.425**	-1.450**	-1.953***	-1.956***	-2.113***	-2.109***	-2.288***	-2.289***
	(0.679)	(0.679)	(0.693)	(0.693)	(0.622)	(0.621)	(0.616)	(0.616)
newUSA*lag1core50*large	-0.664	-0.642	-1.341	-1.346	-2.511***	-2.515***	-2.767***	-2.768***
	(0.964)	(0.965)	(0.941)	(0.941)	(0.849)	(0.848)	(0.835)	(0.835)
fta*lag1core50				-2.773				-1.003
				(5.106)				(4.059)
ftanewUSA*lag1core50		-7.840	-8.947	-6.167		1.234	0.902	1.907
		(6.410)	(6.383)	(7.980)		(5.909)	(5.862)	(7.077)
lag_ln_real_ev_USA_tot					-0.551***	-0.551***	-0.552***	-0.552***
					(0.0209)	(0.0209)	(0.0209)	(0.0209)
Firm Size dummies	No	No	No	No	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	Yes	Yes	Yes	Yes
Sector FE	No	No	No	No	Yes	Yes	Yes	Yes
ATPDEA and MFN dummies	No	No	No	No	Yes	Yes	Yes	Yes
N	17077	17077	17077	17077	17077	17077	17077	17077
r2_o	0.0421	0.0420	0.0417	0.0417	0.172	0.172	0.172	0.172
N_clust	1000	1000	1000	1000	1000	1000	1000	1000

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Equally interesting results are obtained for Model 2 on the *extensive margin*, presented in Table 4.7. The main variables of interest, controlling for new exporters and trade liberalisation, do not experience obvious modifications in sign and significance. The same can be argued for similarities across products, the size of the sector and condition of exporting elsewhere. Appendix B.2 shows, however, that significance is lost when controlling for year and sector fixed effects, ATPDEA and MFN dummies and firm i's past performance in the USA market.

The $core50$ dummy obtains the positive and significant values predicted by the theoretical model. All specifications show that both new firms and incumbents tend to experiment in the USA market with a core product, but such effect tends to be slightly larger for the expert ones. When controlling for the firm size, the role of "core competence" products turns more irrelevant the larger the firm is. As a result, the effect of a top 50% product, as an approximation of less costly products, on the extensive margin is greater for the smallest firms.

Table 4.7: Model 2 - Extensive Margin (Entry), including interactions between core50 and firm size

Dependent Variable	Entry_ijt							
Estimation	LPM							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
new_USA	0.171***	0.171***	0.194***	0.194***	0.168***	0.168***	0.191***	0.191***
	(0.0353)	(0.0354)	(0.0372)	(0.0372)	(0.0353)	(0.0354)	(0.0372)	(0.0372)
fta	-0.676***	-0.688***	-0.814***	-0.796***	-0.564***	-0.575***	-0.701***	-0.684***
	(0.211)	(0.217)	(0.234)	(0.227)	(0.210)	(0.216)	(0.234)	(0.227)
fta*new_USA	1.329***	1.327***	1.221**	1.203**	1.299***	1.296***	1.197**	1.180**
	(0.438)	(0.445)	(0.496)	(0.491)	(0.436)	(0.443)	(0.493)	(0.489)
similar_prod	0.221***	0.221***	0.336***	0.336***	0.218***	0.218***	0.333***	0.333***
	(0.0200)	(0.0200)	(0.0275)	(0.0275)	(0.0201)	(0.0202)	(0.0277)	(0.0277)
ln_lag_n_sec_exp_USA					0.0472***	0.0472***	0.0456***	0.0456***
					(0.00744)	(0.00744)	(0.00743)	(0.00743)
gr_ln_real_sector_USA_exports					-0.0337**	-0.0337**	-0.0336**	-0.0337**
					(0.0153)	(0.0153)	(0.0153)	(0.0153)
newUSA*lag1else	0.104***	0.104***	0.120***	0.120***	0.104***	0.105***	0.120***	0.120***
	(0.0382)	(0.0382)	(0.0373)	(0.0373)	(0.0381)	(0.0381)	(0.0372)	(0.0372)
core50	0.723***	0.725***	0.728***	0.726***	0.723***	0.724***	0.728***	0.726***
	(0.0221)	(0.0225)	(0.0225)	(0.0222)	(0.0220)	(0.0224)	(0.0224)	(0.0221)
core50*small	-0.211***	-0.211***	-0.206***	-0.206***	-0.214***	-0.214***	-0.209***	-0.209***
	(0.0415)	(0.0415)	(0.0406)	(0.0406)	(0.0415)	(0.0415)	(0.0405)	(0.0405)
core50*medium	-0.356***	-0.356***	-0.347***	-0.348***	-0.361***	-0.360***	-0.352***	-0.352***
	(0.0405)	(0.0406)	(0.0398)	(0.0398)	(0.0404)	(0.0405)	(0.0397)	(0.0397)
core50*large	-0.590***	-0.591***	-0.577***	-0.576***	-0.593***	-0.594***	-0.581***	-0.579***
	(0.0645)	(0.0646)	(0.0625)	(0.0624)	(0.0646)	(0.0646)	(0.0625)	(0.0624)
newUSA*core50	-0.119**	-0.118**	-0.0772	-0.0752	-0.118**	-0.118**	-0.0770	-0.0752
	(0.0475)	(0.0485)	(0.0510)	(0.0507)	(0.0475)	(0.0485)	(0.0510)	(0.0506)
newUSA*core50*small	0.00702	0.0120	0.0969	0.0964	0.00789	0.0127	0.0972	0.0968
	(0.0832)	(0.0827)	(0.0717)	(0.0716)	(0.0833)	(0.0827)	(0.0718)	(0.0718)
newUSA*core50*medium	-0.137	-0.126	-0.0771	-0.0772	-0.135	-0.124	-0.0754	-0.0755
	(0.0962)	(0.0992)	(0.0960)	(0.0960)	(0.0960)	(0.0989)	(0.0957)	(0.0957)
newUSA*core50*large	0.0758	0.0757	0.153	0.151	0.0728	0.0725	0.149	0.148
	(0.118)	(0.118)	(0.119)	(0.119)	(0.116)	(0.117)	(0.118)	(0.118)
core50*similar		0.240	0.328			0.211	0.298	
		(0.447)	(0.455)			(0.447)	(0.455)	
fta*core50		0.509	0.862	1.188		0.527	0.880	1.176
		(1.781)	(1.458)	(1.380)		(1.770)	(1.451)	(1.374)
ftanewUSA*core50			-0.227***	-0.227***			-0.226***	-0.226***
			(0.0481)	(0.0481)			(0.0481)	(0.0481)
newUSA*similar			-0.243***	-0.243***			-0.242***	-0.242***
			(0.0398)	(0.0398)			(0.0397)	(0.0397)
fta*similar			1.598***	1.584***			1.581***	1.568***
			(0.457)	(0.455)			(0.459)	(0.457)
ftanewUSA*similar			-1.086	-1.072			-1.096	-1.084
			(0.669)	(0.668)			(0.669)	(0.668)
Firm Size dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	28488	28488	28488	28488	28488	28488	28488	28488
r2_o	0.106	0.106	0.111	0.111	0.107	0.107	0.112	0.113
N_clust	1158	1158	1158	1158	1158	1158	1158	1158

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Under the same logic, I re-estimated Model 3 on *exit*, which results are illustrated in Table 4.8. The patterns identified for the main variables of interest are almost identical to those in the first results. Hence, less experienced firms are more likely to stop exporting a product to USA, but trade liberalisation prevents them from making that decision.

When looking at the results for products being a "core competence" in period t, it is clear that such condition encourages the firm to keep on exporting that product to USA, given the negative and significant sign for $core50$. This encouraging effect is shown to be even larger for the least experienced firms, derived from the negative and significant coefficients for the interaction with $new\_USA_{i,t-1}$ in columns (4)-(6). Nonetheless, when controlling for the firm size, the exit-preventing effect for both new and expert firms gets offset the larger the firm is, proving that such effect is more relevant for the smallest ones. Further similar results are presented in Appendix B.2.

Table 4.8: Model 3 - Exit (core competence in t), including interactions between core50 and firm size

Dependent Variable	Exit_ijt					
Estimation	LPM					
Column	(1)	(2)	(3)	(4)	(5)	(6)
new_USA	0.159***	0.161***	0.160***	0.191***	0.192***	0.192***
	(0.0248)	(0.0249)	(0.0249)	(0.0175)	(0.0175)	(0.0175)
fta	0.243	0.242	0.304	-0.221	-0.221	-0.228
	(0.263)	(0.263)	(0.289)	(0.172)	(0.172)	(0.183)
fta*new_USA	0.538	0.637	0.574	0.697***	0.755***	0.762***
	(0.430)	(0.453)	(0.468)	(0.269)	(0.281)	(0.289)
newUSA*lag1else	0.0101	0.0103	0.0103	-0.0840***	-0.0839***	-0.0839***
	(0.0324)	(0.0324)	(0.0324)	(0.0215)	(0.0215)	(0.0215)
core50	-0.657***	-0.657***	-0.660***	-0.311***	-0.310***	-0.310***
	(0.0159)	(0.0159)	(0.0160)	(0.0145)	(0.0145)	(0.0147)
core50*small	0.228***	0.227***	0.225***	-0.0362*	-0.0370*	-0.0368*
	(0.0217)	(0.0217)	(0.0215)	(0.0207)	(0.0207)	(0.0207)
core50*medium	0.290***	0.288***	0.288***	-0.0543*	-0.0551*	-0.0550*
	(0.0256)	(0.0256)	(0.0255)	(0.0286)	(0.0285)	(0.0286)
core50*large	0.383***	0.382***	0.382***	-0.119**	-0.120**	-0.120**
	(0.0340)	(0.0341)	(0.0341)	(0.0530)	(0.0530)	(0.0530)
newUSA*core50	0.0316	0.0229	0.0252	-0.236***	-0.241***	-0.241***
	(0.0355)	(0.0354)	(0.0354)	(0.0289)	(0.0289)	(0.0290)
newUSA*core50*small	-0.102***	-0.106***	-0.105***	0.0490	0.0467	0.0465
	(0.0370)	(0.0370)	(0.0369)	(0.0370)	(0.0371)	(0.0371)
newUSA*core50*medium	-0.147***	-0.148***	-0.148***	0.142***	0.142***	0.142***
	(0.0420)	(0.0417)	(0.0417)	(0.0411)	(0.0411)	(0.0411)
newUSA*core50*large	-0.156***	-0.156***	-0.156***	0.342***	0.342***	0.342***
	(0.0563)	(0.0562)	(0.0562)	(0.0579)	(0.0581)	(0.0581)
fta*core50			-0.511			0.0548
			(0.349)			(0.281)
ftanewUSA*core50		-0.992*	-0.483		-0.554	-0.609
		(0.536)	(0.632)		(0.454)	(0.530)
lag_ln_real_ev				0.0498***	0.0495***	0.0498***
				(0.00162)	(0.00168)	(0.00162)
Firm Size dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	Yes	Yes	Yes
Sector FE	No	No	No	Yes	Yes	Yes
ATPDEA and MFN dummies	No	No	No	Yes	Yes	Yes
N	31882	31882	31882	27434	27434	27434
r2_o	0.0418	0.0419	0.0418	0.188	0.188	0.188
N_clust	2599	2599	2599	2599	2599	2599

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level; ***Denotes statistical significance at the 1% level.

I additionally developed an exercise employing the first lag of $core50$, displayed in Appendix B.2, in which the outcome for the main variables of interest do not change materially. Like in the main results, however, the effect of exporting a product that was a "core competence" in $t-1$ is interpreted in a different way, since that condition is associated with a higher exit probability, for both new firms and incumbents in the USA market. But if I control for the firm size, that increase in the exit likelihood gets lower and even turns into a negative effect on exit the larger the firm is. Therefore, I can argue that, since the smallest firms are likely to have a brief experience exporting j, the fact that such a good is currently a core product, encourages them more to remain exporting it to USA. For larger firms, which presumably have more experience producing a core product, that past experience seems to be more influential for them to make the decision to stay in the export business to USA with that product.

4.5.2 Alternative Criteria for Core Products

Throughout the research, I have been considering a product as a core competence for a firm if its annual export sales accounted for a minimum of 50% of firm i's total exports to the world. Such assumption may be judged as very restrictive, leading to a limited amount of goods treated as core. Hence, as a next experiment, I expand the definition of "core competence" to a wider range of products, by creating the $core25$ and $core10$ dummies. Thus, I treat product j as core if it accounts for a minimum of 25% and 10% of firm i's total annual sales to the rest of the world, respectively. These dummies are included into the models on their own and interacted with $new\_USA_{i,t-1}$ and the liberalisation variables. Recall that in Models 2 and 3 I control for the level of the core dummies; while for Model 1 I consider the first lag.

The main results for the experiment with the $core25$ and $core10$ dummy can be found at Appendices B.3 and B.4, respectively. Overall, the findings I obtained from the main exercise with the $core50$ variables hold for these alternative definitions of core competence products; both in terms of sign and significance. In terms of the value of the estimates, no major changes are perceived either; perhaps a slight reduction in the absolute value of some estimates when changing the core competence definition from 50% to 25%; and a subsequent tiny rise of values when moving from 25% to 10%.

4.5.3 Annual Transactions Greater than US$ 1,000

Diverse studies working with firm-level exports data make use of a lower bound for annual exports, in order to prevent any distortions or biases probably caused by very small export transactions, such as sample deliveries. For this research, given the massive presence of annual exports per firm/product pair lower than US$ 1,000, I employ this value as a lower bound, so as to compare the subsequent results with the original regressions. By using that threshold, Model 1's dataset drops by 33.6%; 43.7% for Model 2 on entry; and 46.5% for Model 3 on exit.

As in previous robustness checks, the main conclusions on the effects of being a new exporter, trade liberalisation, and core competence products are not affected, both in terms of signs and significance of the estimates.

Regarding the values of coefficients, some patterns can be mentioned. In Model 1, the effect of being a one-year experienced firm in the US market on export growth tends to be greater, as well as the effect of exporting a product that was not a core competence in $t-1$. In Model 2 on entry, $new\_USA_{i,t-1}$ gets lower values; the difference in the effect of trade liberalisation between new and expert firms (comparing values of fta_{jt} and $fta * new\_USA_{ijt}$) turns larger in favour of the incumbents; and the effect of product j being a core one gets slightly larger. Finally, for Model 3, the positive relation between being a newcomer and the exit likelihood gets smaller. Also, the exit-preventing role of trade liberalisation for less expert firms loses strength; while the effect of core competence products on exit prevention gets larger, especially for more consolidated firms. The details of these results can be found in Appendix B.5.

4.6 Conclusions

In Chapter 3, I developed a theoretical approach pursuing to illustrate the firms' export strategy in a particular destination, with uncertain export profitabilities, assumed to be correlated across products and over time. Depending on their known costs and expected profits, a firm may decide to export products sequentially over time, simultaneously, or not to enter at all to that destination.

From that framework, three predictions were inferred regarding the export dynamics of new exporters (one-year experience in a destination) in terms of their growth in the *intensive margin*, *extensive margin* and their *exit* probability from an export business, considering the role of trade liberalisation and the difference between "non-core" and "core competence" products.

These predictions are empirically tested in this chapter with a very rich dataset of Peruvian exports to the USA market, at the firm-product level, from 2006 to 2013. Both theoretical and empirical approaches consider the issue of trade liberalisation and the difference in dynamics across products, depending on the "core competence" condition of a product for a firm. This research is one of the first attempts to measure the effects of the Free Trade Agreement signed by Peru and the United States on the performance of Peruvian exporters.

Overall, the results from my empirical tests give support to the predictions derived from the theory. There is a positive association, conditional on survival, between the "new exporter" condition of a firm in the USA market, compared to more consolidated ones, and the export growth for the first products it sells to that destination (intensive margin). A boost is also established at the extensive margin, since newcomers to the USA are more likely to export a new product to that market in the future than the incumbent firms. Nevertheless, those newcomers are more likely to stop exporting a product there than the experts.

From my outcomes, trade liberalisation, expressed as the tariff elimination by USA on Peruvian products via the Free Trade Agreement in 2009, does not seem to mean an additional incentive to firms, especially the new entrants, to grow at the intensive margin. It does represent a boost for more experienced firms to export new products to USA (extensive margin) compared to newcomers, just like the theoretical model entails. But the results also confirm that trade liberalisation prevents the least expert Peruvian firms from exiting the export business of a particular product to USA.

There are differences in the effect of being a new exporter across products. For the intensive margin, the export growth of a new firm selling to USA is larger for non-core competence products –not so well-performing goods–, matching the theory's implications. Also backing the theoretical predictions, a Peruvian newcomer to USA is more likely to begin exporting a relatively good product in terms of sales –a core-competence product–, and even more likely if that product is similar to others previously exported. Besides, if the product is a core-competence one, that new firm is less likely to stop exporting it. Moreover, according to my robustness checks, all these mentioned effects are larger for the smallest firms, measured in terms of mean annual exports. Nonetheless, it is necessary to point out that the core-competence effects on the extensive margin tend to be more important for incumbents than for new exporters.

The analysis implemented is limited by the lack of data, such as firm-specific characteristics to account for heterogeneity or product-specific information on production costs.

There are surely other factors that affect firms' decision to enter or exit the export business in the USA market, from both the supply and demand side. One of those is the economic crisis occurred in 2009, the same year the USA-Peru FTA came into force. I disentangle the effects of liberalisation from the crisis by considering the tariff reduction per product. The lack of significance of trade liberalisation in the extensive margin model might be due to other factors not considered in firms' decision-making process, such as the anticipation of the 2009 USA-Peru FTA. This issue can be accounted for in further stages, as well as the fact that some industries are more credit constrained than others, affecting their performance in the export market.

Additional experiments to complement the findings of this research can be done, like the reformulation of the "new exporter" criterion. It would be interesting to consider two, three-year or even six-month experienced exporters as new to see how the initial results change.

Future research on the effect of trade liberalisation by USA on Peruvian export dynamics may include the geographical spread of trade at the firm level, inspired by a recent working paper by Borchert (2009a). That is, does the trade liberalisation process between Peru and the United States boost Peruvian exporters' decision to enter third markets and increase their sales to those markets? The effects of this FTA and the previous unilateral liberalisation by USA under the ATPDEA regime on the duration (survival) of Peruvian firms' trade relations with that country may also be an interesting issue of further research.

5 Experimentation Speed Across Products: Evidence from Peru in the USA Market

5.1 Introduction

Recent literature on firm export dynamics has found that firms surviving in the export activity tend to experiment sequentially in the foreign market; but how fast do they experiment in that activity? And what factors determine that *experimentation speed*?

Albornoz et al. (2012) is one of the first studies on export sequential strategy, finding that new Argentinean exporters, despite having a higher probability of exiting the export business, grow more at the intensive and extensive margin, conditional on survival, compared to more established exporters. That is, surviving new exporters undertake a *sequential exporting* process.

Those described dynamics occur across destinations, leaving as a pending concern how dynamics in export decisions by firms work within one destination, across products. Moreover, the way trade liberalisation may affect those decisions remains insufficiently addressed.

Works like Albornoz et al. (2012) obtain that, by realising their export profitability in one market, firms may sequentially decide to sell to further destinations in the next period. However, that is not a real time estimation, either across markets and products within one destination. How fast do firms introduce a new product to a particular market? What factors determine the acceleration or delay of that decision? Does trade liberalisation play a role in this process?

Other studies on firm export dynamics focus on firms' probability to survive and/or exit the export activity. Roberts and Tybout (1997) and Eaton et al. (2008) describe the export entry and exit decision processes for Colombian firms. In the Peruvian context, Freund and Pierola (2010) theoretically explains the export entry determinants in terms of costs; while Malca and Rubio (2012) addresses the role of tenure as a driver of firms' export survival.

In that same line, other researches measure the duration of firms' permanence in the export activity and its determinants, by applying conventional methods like the Kaplam-Meier survival estimator or the Cox proportional hazard model. Indeed, Besedeš and Prusa (2006b) use these approaches to explore the role of product differentiation in the duration of USA import relationships. Volpe Martincus and Carballo (2008), with the same techniques, analyse the effect of product and geographical diversification, along with firm size, on the survival likelihood of Peruvian firms in the export business.

Even in the literature on multi-product firms, the use of duration models is practically limited to examining the survival of products in a firm's export portfolio. To my knowledge, no previous works on firm export dynamics have applied those methods under a more positive focus. One in which the event of entering into the export activity, i.e. a success, is analysed. One example is the decision to introduce a new product into a particular destination.

There is also a growing literature on experimentation in different areas, whereby the decision to undertake one particular action may be delayed, by gradually updating agents' beliefs on the payoff from that action. The use of that approach to illustrate firms' export strategies is quite recent, either by the role of learning from neighbour firms, like Fernandes and Tang (2014), or firms' previous experience in other markets, like Akhmetova and Mitaritonna (2012) and Nguyen (2012). Hence, firms' decision to introduce a new product to a market of interest by updating their beliefs on the demand for that product, given their previous experiences with other goods in that destination, is a subject of potential research under that approach.

Given the described gaps, this chapter contributes to the literature by developing a theoretical model, empirically tested afterwards, explaining how quickly firms sequentially export products to a particular destination, incorporating the role of trade liberalisation and the firms' experience with other products in the market of interest. That is, what is the *experimentation speed* of firms across products in a market? In my approach, such speed is measured by the number of shipments of product A to market d by firm i required before deciding to introduce product B to that market. Hence, the fewer shipments of A prior to introducing B, the quicker the experimentation will be. The role of trade liberalisation in this scheme is accounted for as the tariff elimination by the market of interest on products from the country of origin.

I test the prediction from my theoretical model by a survival analysis, using a very rich dataset of Peruvian firms that exported to the United States between 2006 and 2013. I exploit the nature of my dataset, at the transaction level with actual dates, by constructing observations representing the event in which a Peruvian firm introduces one or many new products to the USA market, henceforth called an *experimentation round*. The Peru-USA case is an appropriate one for this research, since the two countries signed a Free Trade Agreement in 2009, and long discussions arose on the new opportunities and potential threats to the Peruvian manufacturing industry, as it was mentioned in Section 4.2. Yet, little is known on the effects of this trade liberalisation process on the performance of Peruvian firms in that market.

By this analysis, not only do I measure the *experimentation speed* of Peruvian firms across products in the USA market. I also investigate whether the tariff elimination by USA on Peruvian products under the USA-Peru FTA plays an accelerating role in firms' decision to introduce a new product to that destination. This role can be assessed by comparing (1) firms founded before and after the FTA enactment; (2) experimentation rounds occurred before and after such enactment; (3) the original tariffs levied on the products introduced; or (4) the treatment given to the products before the FTA (whether the products enjoyed a unilateral USA trade preference). Additionally, I examine whether a firm's prior experience with other products in USA, measured as the mean export shipments of "old" products, exerts an accelerating effect on the decision to experiment with a new product.

My empirical approach embraces a Kaplan-Meier survival estimator, as well as a Cox proportional hazard model, where my time variable is the number of days before the firm's experimentation round i in USA, counting from the day round $i-1$ occurred, or firm's foundation. I also run OLS and panel data regressions at the experimentation round level, where my dependent variable is the number of shipments of product A before the introduction of product B to USA by a firm. Overall, the results find that trade liberalisation is associated with an acceleration of the introduction of new products into that market. Such acceleration tends to be larger for products with higher pre-FTA tariffs that were not included in pre-FTA unilateral trade preferences by USA, such as the ATPDEA regime or the MFN zero tariff. Moreover, in the case of firms founded before the FTA enactment, trade liberalisation tends to facilitate the introduction of new products after having sent smaller values of previous products.

The remainder of the chapter is organised as follows. Section 5.2 presents the theoretical model. Section 5.3 describes the data and offers a descriptive analysis of Peruvian firms exporting to the USA market, focusing on their experimentation rounds. Section 5.4 presents the Kaplan-Meier survival analysis. Section 5.5 shows the results from my econometric approach. Section 5.6 concludes.

5.2 The Model

The basics of my theoretical model are inspired from a previous study by Albornoz et al. (2012) on sequential exporting across markets.

A producer from country o evaluates whether to export or not to country d, with a product portfolio consisting of products A and B, in a scenario where the firm is *ex ante* uncertain about its export profitability in that market. If the firm decides to enter d, it will have to pay a sunk entry cost F_d per product, assumed to the identical across products, meant to reflect distribution channels, marketing strategy and exporting procedures, which might be specific to each kind of product. I assume other common entry costs across products within a market, such as information on institutional and policy characteristics of the foreign country, to be minimal and/or easily accessible to firms.

When exporting products A and B to country d, firms must pay a product-specific unit trade cost (tariff levied by d) τ^A and τ^B.[36] Variable costs per product comprise a unit export cost c_x and a firm-specific unit production cost, c_p^A and c_p^B. While production costs are known to the firm, unit export costs are unknown.

The demand side, on the other hand, is represented by the following function:

$$q^j(p^j) = d^j - p^j, \tag{5.1}$$

where q^j denotes the quantity of product A or B exported; p^j is the price of that product; and d^j is an unknown demand component. Hence, uncertainty can be found in both the supply and demand sides. The calculation of firms' export profitability for product $j = \{A, B\}$, denoted as μ^j, will then consider the unknown demand component and the unknown unit export cost, as well as the known unit production cost:

$$\mu^j \equiv d^j - c_x - c_p^j. \tag{5.2}$$

The unknown components of that export profitability of product j in destination d, $d^j - c_x$, can be summarised by the term μ^{Nj}. Hence, to determine the optimal quantity of product j exported to d at any time, firms maximise their profits –revenues minus costs–,

[36] I make the assumption that home firm pays the tariff, since I do not have information on importers.

expressed by:

$$\pi^j = (\mu^{Nj} - c_p^j - \tau^j - q^j)q^j. \tag{5.3}$$

Consider an initial scenario where $\tau^A + c_p^A \leq \tau^B + c_p^B$, meaning that it is cheaper for the firm to produce and export product A. As this model focuses on a sequential entry strategy in market d, I present the case in which the firm first introduces the cheapest product A, subsequently selling the more costly product B.

When deciding to introduce product A to d, the firm maximises profits from Equation 5.3, considering its expected export profitability from selling A, $E\mu^{NA}$. If such expected profitability is greater than the known costs $\tau^A + c_p^A$, then the optimal export value for product A is:

$$\hat{q}^A = \begin{cases} \dfrac{E\mu^{NA} - c_p^A - \tau^A}{2} & \text{if } E\mu^{NA} > \tau^A + c_p^A; \\ \varepsilon & \text{otherwise.} \end{cases} \tag{5.4}$$

It must be pointed out, however, that even if the firm's initial expectations on the export profitability from product A are pessimistic ($E\mu^{NA} \leq \tau^A + c_p^A$), it may be tempted to sell an arbitrarily small value ε of product A to d, so as to have a preliminary view of demand in that market. Returning to the optimistic case, $\hat{q}^A$ is plugged into Equation 5.3 to obtain the maximised profits from introducing A to d:

$$\hat{\pi}^A = \left(\frac{E\mu^{NA} - c_p^A - \tau^A}{2}\right)^2. \tag{5.5}$$

The process described from Equation 5.3 to 5.5 also applies for the introduction of product B; but the gross maximised profits must be greater than the sunk entry cost F_d, for the firm to decide to send a first shipment of B to d. Hence, the firm introduces product B if:

$$\left(\frac{E\mu^{NB} - c_p^B - \tau^B}{2}\right)^2 \geq F_d. \tag{5.6}$$

Then, Equation 5.6 can be rearranged to obtain a minimum value required for $E\mu^{NB}$ to decide to export B:

$$E\mu^{NB} \geq 2F_d^{1/2} + \tau^B + c_p^B. \tag{5.7}$$

One important assumption in this scheme is that export profitabilities are imperfectly correlated across products. Then, assuming that those profitabilities per product followed a bivariate normal distribution, with parameters $(E\mu^{NA}, E\mu^{NB}, \sigma^A, \sigma^B, \rho)$, I obtain a function for the expected export profitability for B, given the realisation of A:

$$E(\mu^{NB} \mid \mu^{NA}) = E\mu^{NB} + (\mu^{NA} - E\mu^{NA})\rho\frac{\sigma^A}{\sigma^B}. \tag{5.8}$$

This outcome implies that $E(\mu^{NB} \mid \mu^{NA}) \geq 2F_d^{1/2} + \tau^B + c_p^B$ for the firm to decide to export B. From Equation 5.8, I could find a cutoff value of μ^{NA} above which the *sequential exporting* strategy would be undertaken.

However, under the scheme outlined so far, the firm only needs one shipment of product A to automatically realise the export profitability of that product, and that single piece of information is sufficient to decide whether to export B or not in the next period.

It is pertinent then to consider the more realistic assumption that the firm requires further shipments to be more certain about the demand of product A in market d. That will not only provide a better view of the demand for A; but will also give a tool to update the firm's expected export profitability of product B, leading to a better backed export decision. Furthermore, to simplify the model, I propose to take the uncertain export profitability as solely a function of the unknown demand of product j from destination d; namely, the intercept of Equations 5.1 and 5.2, d^j, which henceforth is denoted as x^j.

The maths and notation presented hereafter are inspired from Nguyen (2012), on delays in the export decision across destinations. Every shipment of product A provides one piece of information on the demand of that good, meaning that the firm is gradually realising the actual demand of A in market d. However, with those shipments, the firm is also updating its expected demand of product B. I propose that each shipment of A produces one perceived demand x_i^A. All these perceived demands may be gathered in one random vector $x^A \equiv [x_1^A, \ldots, x_j^A, \ldots, x_J^A]$, where J is an arbitrarily large number of possible shipments.

I assume that demands for A and B in market d (x^A and x^B) follow a joint bivariate distribution. If the firm has not entered d yet, the moments of those demands collapse to:

$$E[x^A] = E[x^B] = 0. \tag{5.9a}$$

$$Var[x^A] = Var[x^B] = \sigma_0^2 > 0. \tag{5.9b}$$

$$\frac{Cov(x^A, x^B)}{\sigma_0^2} = \rho \rightarrow 0 < \rho < 1. \tag{5.9c}$$

While the firm begins exporting the less costly product A, it will be gradually updating its realised demand by calculating the mean demand term of that product, considering $I_A \subseteq J$, the number of shipments so far:

$$\overline{x^A} = \frac{\Sigma_{i \in I_A} x_i^A}{I_A}. \tag{5.10}$$

However, when it comes to decide to export product B to market d, the expected value and variance of the demand for that product are updated in function of the number of shipments of A and the correlation coefficient. These values are obtained from the following functions:[37]

$$E[x^B \mid I_A] = \mu_{I_A}^B = \left(\frac{\Sigma_{i \in I_A} x_i^A}{I_A}\right)\left(\frac{I_A \rho}{I_A \rho + (1-\rho)}\right). \tag{5.11a}$$

$$Var[x^B \mid I_A] = \sigma_{I_A}^2 = \sigma_0^2\left(1 - \frac{I_A \rho^2}{I_A \rho + (1-\rho)}\right). \tag{5.11b}$$

Equations 5.11a and 5.11b imply a role for the number of shipments I_A. The more the firm has experimented with product A, the more its expected demand for B approaches to the sample mean of perceived demand for A. In other words, the firm is trusting more its own experience in market d with product A. Furthermore, the larger I_A, the lower the variance of B's demand $\sigma_{I_A}^2$. Hence, the firm is able to predict the demand x^B more precisely.

Let me go through the implications from extreme cases. When $I_A = 0$, meaning that firm i has not experimented yet with product A in market d, the expected demand of both A and B converge to zero, as in Equation 5.9a. When, instead, I_A tends to its maximum value J, the second term in brackets in the right hand side of Equation 5.11a

[37]See Appendix C.1 for the proof for these functions.

will converge to unity. Hence, as mentioned above, the firm will practically rely solely on its own experience in market d with product A to decide on B.

Similar implications can be inferred for the correlation coefficient of products A and B. When $\rho = 0$, then $\mu^B_{I_A}$ will converge to zero, since experimenting with A does not provide any information on the demand of B in destination d. Conversely, when $\rho = 1$, its maximum value, then the second term in brackets from Equation 5.11a will converge to unity, meaning that firm i's own experience with product A provides full information to decide on product B in market d. Moreover, $\rho = 1$ makes $\sigma^2_{I_A}$ converge to zero, confirming the earlier statement.

There is an interesting implication when ρ lies between zero and unity, accounting for imperfect correlation of export profitabilities across products A and B. The second term in brackets of Equation 5.11a becomes lower than unity, which in turn represents a sort of penalty against the sample mean of the perceived demand of A –the first term in brackets–. In other words, the expected demand of B given the experience with A gets diminished by that second term, implying that what firm i has perceived so far from A is not sufficient to opt to introduce B into market d, and more information from A is required, translated into more shipments of A.

With the criteria presented above, I can then continuously compare the expected value of the demand for product B, given the updated realisations of the demand for A, with the known costs of B. If that updated expected demand for B equalises or exceeds those costs, then the firm will be prompted to make a first shipment of B to market d. Thus, if I replace μ^{NB} in Equation 5.7 with the function for $\mu^B_{I_A}$ in Equation 5.11a, that yields the following:

$$\left(\frac{\Sigma_{i\in I_A} x^A_i}{I_A}\right)\left(\frac{I_A\rho}{I_A\rho + (1-\rho)}\right) \geq 2F_d^{1/2} + \tau^B + c^B_p. \tag{5.12}$$

By rearranging Equation 5.12 and denoting the right hand side of that function as TC_B –total known costs of product B–, I can obtain a cutoff value for the number of shipments of product A. Taking the first term in brackets of Equation 5.12, the sample mean of the perceived demand of A, as $\overline{x^A}$, I obtain the following condition:

$$I^*_A \geq \frac{(1-\rho)TC_B}{\rho(\overline{x^A} - TC_B)}. \tag{5.13}$$

Equation 5.13 then displays a minimum number of shipments of product A required by firm i to decide to send one first shipment of product B to market d. From this condition, I can infer that cutoff value of I_A becomes lower if any of the total known costs of B, such as the unit trade cost τ^B, falls or is eliminated. Namely, when tariffs are eliminated under a trade liberalisation process, the number of shipments of A required to make a decision on B is reduced; or, the length of the experimentation time with product A in market d prior to the first shipment of B becomes shorter. Similarly, a higher ρ, the more correlated the demands of A and B are, the lower the cutoff value of I_A will be, since now the firm will require less information from A, which will be sufficient to make a decision on B.

These findings can be summarised in one single proposition, empirically tested afterwards.

Proposition 1: *There is a cutoff value for I_A, inversely related to ρ, the correlation between the demands of products A and B, as well as $\overline{x^A}$, the sample mean of the perceived demand of product A. Such cutoff is also directly related to F_d, the sunk entry cost per product, τ^B, the unit trade cost of product B, and c_p^B, the firm-specific unit production cost of B.*

Let me explore this proposition more deeply by calculating the derivative of the cutoff number of shipments of product A with respect to the main variables of interest. That leads to the following results:

$$\frac{\partial I_A^*}{\partial \tau^B} = \frac{1}{[(1-\rho)(2F_d^{1/2}+\tau^B+c_p^B)][\rho(\overline{x^A}-2F_d^{1/2}-\tau^B-c_p^B)]} > 0. \tag{5.14a}$$

$$\frac{\partial I_A^*}{\partial \overline{x^A}} = \frac{-1}{(1-\rho)(2F_d^{1/2}+\tau^B+c_p^B)(\overline{x^A}-2F_d^{1/2}-\tau^B-c_p^B)} < 0. \tag{5.14b}$$

$$\frac{\partial I_A^*}{\partial \rho} = \frac{-\overline{x^A}}{[(1-\rho)(2F_d^{1/2}+\tau^B+c_p^B)][\rho(\overline{x^A}-2F_d^{1/2}-\tau^B-c_p^B)]} < 0. \tag{5.14c}$$

It can be observed that the relation between the variables of interest and I_A^* clearly depends on the initial values of those variables, although the sign of that effect remains unchanged.[38] Let me first focus on $\overline{x^A}$, the sample mean of the perceived demand of A. From Equations 5.14a and 5.14b, the size of the slope of I_A^* is lower in absolute value for larger mean perceived demands of A; whereas Equation 5.14c shows a more negative relation for larger demand perceptions of A. For the correlation coefficient and

[38] The signs of the effects on I_A^* are obtained under the assumption that $\overline{x^A} > 2F_d^{1/2}+\tau^B+c_p^B$. Otherwise, the signs change. However, in a case where $\overline{x^A} < 2F_d^{1/2}+\tau^B+c_p^B$, it makes no sense to export B.

known costs, such as τ^B, the analysis is more complicated. Indeed, the size of the three derivatives is larger for extreme high and low values of those variables, meaning that the slopes are not linear. These dynamics described should be taken into account when it comes to testing Proposition 1 and interpreting the results.

Given the data availability, I may test the effect of trade liberalisation, as a tariff elimination by country d on most products, on the firm's number of shipments of old products prior to the first shipments of a new product to market d. The number of shipments may also be proxied by the length of the time spell between the first shipment of product A and the equivalent of product B. The data also allows me to measure the impact of the mean export value of product A before the first shipment of B, as a proxy for the perceived demand of A in market d.

Before moving on to the empirical testing, it is pertinent to point out that the outcome of my theoretical model, particularly the role of the number of shipments prior to the introduction of a new product, is somehow related to a recent theoretical approach by Albornoz et al. (2016). That research highlights the role of export experience on survival in the export market and its relation with the degree of sunk and fixed costs borne by a firm in each destination attended. The authors find that export experience raises the survival probability of a firm in a destination upon entry, by reducing the fixed costs relative to the sunk entry costs.

Bringing that rationale to my model across products within one market, if I allow my sunk entry cost per product F_d to vary with experience with previous products – represented by the number of shipments of product A–, I may work on the relation from Equation 5.12 and find a function for F_d, negatively related to I_A. Such function may be treated as a cutoff value of the entry cost, below which the introduction of product B is profitable. Thus, the more the firm ships of product A to market d, the more experience the firm accumulates from that destination, reducing the entry costs for product B, and facilitating experimentation with that product. This is an issue for potential further research in future studies on the matter.

Let me also relate my theory with another previous work by Araujo et al. (2016). In a model where producers from a country aim to build a trade relationship with a reliable distributor from the destination country to export to that market in an environment with incomplete information, these authors predict that producers selling to countries with good contracting institutions, or similar to other markets previously served, start with higher volumes. Additionally, producers are more likely to keep serving those markets in the future, although this latter effect may vanish.

It is true that my model does not investigate on the volume with which a firm starts selling product B in market d. But the mean perceived demand from product A may be taken as an equivalent of firm's previous experience. Hence, the more experience accumulated in market d prompts the firm to keep on experimenting in that market by introducing a new product, strengthening the trade relation built and making it more durable over time. Moreover, a tariff elimination can be considered a proxy for an improvement in the contracting institutions of a country, since it contributes to facilitate the export activity. Hence, it makes sense to argue that better institutions accelerates the introduction of product B in d after experimenting with product A, also consolidating the trade relation.

5.3 Data and Summary Statistics

5.3.1 The Data

5.3.1.1 Data Processing

For the research in this chapter, I departed from the same Peruvian export transaction-level data described in chapter 4, covering the same eight manufacturing sectors, as well as the USA tariff information at the 8-digit level and Peruvian firms' dates of foundation and closure.

For the purposes of this chapter, however, the data processing implemented was on a daily basis and, to some extent, on a monthly basis as well. Hence, the first descriptive variables, such as exports per firm and destination, number of products and destinations and categorical variables per market, were constructed on those bases.

As I did in the previous chapter, I initially kept in my dataset the information from 1998 to 2013; but for the subsequent survival analysis and econometrics I reduced the time period to 2006-2013, considering only firms starting their business within that lapse.

My main interest in this research is the event of a firm introducing one or more new 8-digit tariff lines into a particular market, which henceforth is called an *experimentation round*. In that sense, I processed my firm-daily data in such a way to capture those dates in which the firm exports for the first time one or more products to USA, as well as the time spell between experimentation rounds by a firm. The intended outcome is a dataset in which each observation represents an experimentation round.

One basic feature of my theoretical approach is the number of shipments prior to the introduction of a new product by a firm. For such reason, from my large combined daily dataset I was able to capture the number of days a Peruvian firm has shipped one or more products both to USA and all other destinations. Here, I am assuming that one shipment is equivalent to one product/destination/day, given the initial data collapsed at the daily level, i.e. shipments are summed to a daily basis. This process has also allowed me to calculate the mean value of those shipments before a new experimentation round, featured in my theoretical model. It is shown afterwards that I utilise both the mean exports to USA and to all destinations. It is pertinent to point out that for firms' first experimentation round in the USA market, the shipments and mean export values reported are only those to other destinations, and the time spell is measured from firms' date of establishment.

It was particularly important for the dataset to capture, apart from the dates each experimentation round took place, the sequential order of these rounds. Hence, I allocated a number to each round per firm according to its order, so as to undertake further separate analyses across firms, in terms of their first experimentation round, as well as their second and subsequent introduction of new products to USA.

Another issue to take into account is that on a day an experimentation round occurs, a firm may export both new products and other goods introduced earlier. Then, by this data processing I managed to distinguish for each observation between those types of products. Such distinction is very important for the next stage: the incorporation of the pre-FTA USA tariff and and trade preference information.

At that stage, from the large combined dataset, I calculated for every day on which an experimentation round takes place a weighted average pre-FTA tariff, in which the weight is the US $ export value of each product. I obtained two weighted averages: one taking all products sold on a day, and another one considering only the new products introduced, which is more relevant for my analysis. Under the same rationale, I computed another indicator controlling for the $pre-FTA$ unilateral trade preferential treatment by USA to some Peruvian products, i.e. the ATPDEA and zero-MFN tariff regimes. This measure informs how much of the export value of a Peruvian firm in an experimentation round to USA is accounted for by products affected by either of the mentioned regimes. Again, I got this measure for all products sold and another one for only the new products, my attention being focused on the latter.

For the effects of the subsequent survival analysis and econometric approach, I construct several categorical variables to control for some relevant distinctions. For instance, I create a dummy to classify firms as founded after the enactment of the USA-Peru Free Trade Agreement ($post - FTA$ firms); another one capturing experimentation rounds comprising the introduction of more than one product (the *many* dummy); a variable for firms' experience in other markets prior to a new experimentation round in USA, denoted as *elsewhere*; and categorical variables for the sector the products exported in an experimentation round belong to.[39]

One last important issue to mention is that, since my empirical approach comprises a survival analysis and duration econometric models, I had to be able to control for right-censoring at the firm level. In other words, I had to consider those firms which never exported to USA within my sample, as well as those which, after experimenting in that market, no longer do it until the end of 2013 or simply close down. I control for this feature by adding extra observations into the experimentation round dataset. For firms that never exported to USA, I make use of a 3-year cutoff, whereby, after 3 years of existence, the firm is dropped from my sample. Hence, for an observation of a firm that never entered the USA market, the time spell considered ranges from its foundation date to either its closing date or its last shipment to any other destination, within that 3-year established period. For firms that no longer experiment in USA after their last round, I add an extra observation where the time spell goes from the date of their last experimentation round to either their closing date or their last shipment to any other market.

All these steps led to the final experimentation round dataset, comprising a total of 33,254 observations in USA by Peruvian firms starting their experience in that market between 1998 and 2013. For the econometric approach and descriptive analysis in this chapter, the sample is restricted to firms starting to export to USA from 2006, leading to 15,338 observations.

This resulting daily dataset of new exports consists of a total of 2,426 firms that sold to USA, also including those firms that never exported to USA up to three years since founded, raising the number to 7,806 firms. The sample embraces both firms starting to export to USA with one single products and those starting with more than one good.

[39]For the construction of the *elsewhere* dummy, I made use of the collapsed monthly data on firms' exports to other destinations.

5.3.2 Summary Statistics

5.3.2.1 Firms and Rounds of New Exports

Table 5.1 displays the 7,806 firms considered, according to their year of foundation, regardless of whether they ever exported or not to USA. In some statistics, I distinguish between firms starting before ($pre-FTA$ firms) and from 2009 ($post-FTA$ firms), intending to identify a potential influence of the USA-Peru FTA on firms' experimentation decisions. Hence, I end up with approximately 60% of firms that are $post-FTA$.

Table 5.1: Peru-USA - Exporters per Starting Year 2006-2013

Year	Freq.	Percent	Cum.
2006	1009	12.93	12.93
2007	992	12.71	25.63
2008	1052	13.48	39.11
2009	1149	14.72	53.83
2010	1044	13.37	67.2
2011	1055	13.52	80.72
2012	973	12.46	93.18
2013	532	6.82	100
Total	7806	100	

Source: COMEXPERÚ - SUNAT

Table 5.2 groups the experimentation rounds according to the sector product j belongs to. Agriculture and Textile and Apparel are those accounting for the largest amount of firm export transactions involving new products –*experimentation rounds*–. Hence, for further analyses I gather the six remaining sectors into the group "OTHERS". The upper part considers only the first experimentation round by each firm that ever exported to USA; whereas the lower part includes all rounds registered, leading to a total of 7,532 experimentation rounds by those 2,426 firms. [40]

[40] Products sold in one round may belong to more than one sector. However, the raw daily data shows that products from secondary sectors are mostly sold at minimum unit and transaction values compared to firms' core sectors. Also, the grouping made, which considers exports from six sectors into one category, helps control for this issue, assuming that an experimentation round consists of products from only one of

Table 5.2: Peru-USA - Exporters per Sector 2006-2013

Sector (first exports)	Freq.	Percent	Cum.
Agriculture	792	32.65	32.65
Textile-Apparel	789	32.52	65.17
Others	845	34.83	100
Total	2426	100	

Sector (all new exports)	Freq.	Percent	Cum.
Agriculture	1782	23.66	23.66
Textile-Apparel	3624	48.11	71.77
Others	2126	28.23	100
Total	7532	100	

Source: COMEXPERÚ - SUNAT

Although the focus is the USA market, it is also relevant to take into account firms' experience in other destinations. Nevertheless, the daily basis and the nature of my dataset make it more difficult to control for that experience. As an approximation, I constructed the dummy *elsewhere*, taking value 1 if, between the firm's experimentation round $i-1$ and i in USA, that firm exported to any other destination. In Table 5.3 I distinguish the new export rounds according to that criterion, and it is evident from first experimentation rounds in USA that most Peruvian firms have previous experience in other markets. However, as firms subsequently experiment with more products in USA, it seems they become more focused in that destination, as results for all new exports show.

these three groups.

Table 5.3: Peru-USA - Exporters to USA Only vs. Elsewhere 2006-2013

Elsewhere (first exports)	Freq.	Percent	Cum.
No	298	12.28	12.28
Yes	2128	87.72	100
Total	2426	100	

Elsewhere (all new exports)	Freq.	Percent	Cum.
No	3534	46.92	46.92
Yes	3998	53.08	100
Total	7532	100	

Source: COMEXPERÚ - SUNAT

5.3.2.2 Number of Products Exported

The following tables are concentrated on the number of 8-digit tariff lines exported by a Peruvian firm to USA. Table 5.4 groups firms according to the maximum number of new products introduced by firms in one single experimentation round. The figures show that most firms in the sample (55.15%) experiment with only one new product, followed by a 14.88% of firms exporting up to two new products in a round.

Table 5.4: Peru-USA - Maximum Number of New Products Introduced by a Firm to USA on Day t 2006-2013

N°	Freq.	Percent	Cum.
1	1338	55.15	55.15
2	361	14.88	70.03
3	187	7.71	77.74
4	138	5.69	83.43
5	93	3.83	87.26
6	74	3.05	90.31
7	60	2.47	92.79
8	32	1.32	94.11
9	33	1.36	95.47
10	22	0.91	96.37
11 - 20	65	2.65	99.02
21 - 94	23	0.92	100
Total	2426	100	

Source: COMEXPERÚ - SUNAT

It is equally striking to find that, throughout the 2006-2013 period, slightly more than 40% of firms have only exported one product to USA in total, as Table 5.5 states. Indeed, more than a half of the 2,426 firms that exported to USA during that period, have only introduced up to two products into that market.

To have a clearer view of firms' performance in terms of product experimentation in USA, in Table 5.6 I take all the 7,532 experimentation rounds counted to see how many products these rounds comprise. As expected from the previous numbers, over 64% of these rounds are composed by only one new product.

Table 5.5: Peru-USA - Total Number of New Products Introduced per Firm to USA 2006-2013

N°	Freq.	Percent	Cum.
1	980	40.40	40.40
2	331	13.64	54.04
3	200	8.24	62.28
4	122	5.03	67.31
5	98	4.04	71.35
6	83	3.42	74.77
7	69	2.84	77.62
8	56	2.31	79.93
9	50	2.06	81.99
10	46	1.9	83.88
11 - 20	223	9.2	93.08
21 - 30	89	3.67	95.88
31 - 60	61	2.47	99.26
61 - 256	18	0.72	100
Total	2426	100	

Source: COMEXPERÚ - SUNAT

Table 5.6: Peru-USA - Number of New Products Introduced to USA per Experimentation Round 2006-2013

N°	Freq.	Percent	Cum.
1	4866	64.60	64.60
2	1210	16.06	80.67
3	548	7.28	87.94
4	313	4.16	92.1
5	168	2.23	94.33
6	126	1.67	96.00
7	82	1.09	97.09
8	45	0.60	97.69
9	44	0.58	98.27
10	25	0.33	98.61
11 - 20	80	1.06	99.67
21 - 94	25	0.31	100
Total	7532	100	

Source: COMEXPERÚ - SUNAT

5.3.2.3 Experimentation Rounds per Firm

In the next stage of my descriptive analysis, I am interested in knowing how many rounds of new exports each firm has done to USA in the time period of study. Additionally, how many firms no longer introduce any new products after a particular round of new exports. That exercise is done in Table 5.7, initially for all firms in the sample.

Table 5.7: Peru-USA - Number of Experimentation Rounds by Firm i to USA
All Firms 2006-2013

N° Rounds	Experimenting Firms	%	Non-Exp. Firms	%
1	2426	100.00%	0	0.00%
2	1118	46.08%	1308	53.92%
3	720	29.68%	1706	70.32%
4	533	21.97%	1893	78.03%
5	415	17.11%	2011	82.89%
6	335	13.81%	2091	86.19%
7	280	11.54%	2146	88.46%
8	223	9.19%	2203	90.81%
9	188	7.75%	2238	92.25%
10	160	6.60%	2266	93.40%
11	134	5.52%	2292	94.48%
12	112	4.62%	2314	95.38%
13	105	4.33%	2321	95.67%
14	85	3.50%	2341	96.50%
15	74	3.05%	2352	96.95%
16	65	2.68%	2361	97.32%
17	55	2.27%	2371	97.73%
18	50	2.06%	2376	97.94%
19	44	1.81%	2382	98.19%
20	37	1.53%	2389	98.47%
21	32	1.32%	2394	98.68%
22	28	1.15%	2398	98.85%
23	24	0.99%	2402	99.01%
24	22	0.91%	2404	99.09%
26	20	0.82%	2406	99.18%
27	19	0.78%	2407	99.22%
28	18	0.74%	2408	99.26%
30	16	0.66%	2410	99.34%
32	13	0.54%	2413	99.46%
33	11	0.45%	2415	99.55%
36	9	0.37%	2417	99.63%
38	7	0.29%	2419	99.71%
39	6	0.25%	2420	99.75%
43	4	0.16%	2422	99.84%
55	3	0.12%	2423	99.88%
65	2	0.08%	2424	99.92%
67	1	0.04%	2425	99.96%

Source: COMEXPERÚ - SUNAT

The way to read these results is as follows: from the 2,426 firms that exported one first set of new products to USA, 1,118 firms (46.08%) move one step forward, undertaking a second experimentation round; while the other 1,308 (53.92%) firms never experimented with another new product again. Hence, for the effects of the survival analysis made afterwards, those 1,308 firms are considered as right censored. In a similar way, the next rows can be interpreted, so that only one firm managed to have up to 67 experimentation rounds; leaving the other 2,425 firms as right censored.

For the sake of that survival analysis, it is also necessary to establish differences in performance between $pre-FTA$ and $post-FTA$ firms. Hence, under the same previous rationale, Table 5.8 presents the equivalent exercise separately for both types of firms. It can be seen that the level of experimentation and right censoring across the two groups is very similar. Indeed, 45.47% of $pre-FTA$ firms jumped from the first to the second experimentation round; while that was the case for 46.71% of $post-FTA$ firms. Figures remain similar across the subsequent rounds, with the exception that the most experimenting $post-FTA$ firm has come to 39 rounds of new products, compared to the 67 rounds of one $pre-FTA$ firm.

Table 5.8: Peru-USA - Number of Experimentation Rounds per Firm to USA

(a) Pre-FTA Firms 2006-2008

N° Rounds	Experimenting Firms	%	Non-Exp. Firms	%
1	1225	100.00%	0	0.00%
2	557	45.47%	668	54.53%
3	360	29.39%	865	70.61%
4	273	22.29%	952	77.71%
5	214	17.47%	1011	82.53%
6	174	14.20%	1051	85.80%
7	145	11.84%	1080	88.16%
8	112	9.14%	1113	90.86%
9	100	8.16%	1125	91.84%
10	88	7.18%	1137	92.82%
11	76	6.20%	1149	93.80%
12	65	5.31%	1160	94.69%
13	64	5.22%	1161	94.78%
14	54	4.41%	1171	95.59%
15	45	3.67%	1180	96.33%
16	39	3.18%	1186	96.82%
17	35	2.86%	1190	97.14%
18	31	2.53%	1194	97.47%
19	28	2.29%	1197	97.71%
20	25	2.04%	1200	97.96%
21	22	1.80%	1203	98.20%
22	20	1.63%	1205	98.37%
23	17	1.39%	1208	98.61%
24	16	1.31%	1209	98.69%
26	14	1.14%	1211	98.86%
28	12	0.98%	1213	99.02%
30	11	0.90%	1214	99.10%
33	10	0.82%	1215	99.18%
36	8	0.65%	1217	99.35%
39	5	0.41%	1220	99.59%
43	4	0.33%	1221	99.67%
55	3	0.24%	1222	99.76%
65	2	0.16%	1223	99.84%
67	1	0.08%	1224	99.92%

Source: COMEXPERÚ - SUNAT

(b) Post-FTA firms 2009-2013

N° Rounds	Experimenting Firms	%	Non-Exp. Firms	%
1	1201	100.00%	0	0.00%
2	561	45.80%	640	52.24%
3	360	29.39%	841	68.65%
4	260	21.22%	941	76.82%
5	201	16.41%	1000	81.63%
6	161	13.14%	1040	84.90%
7	135	11.02%	1066	87.02%
8	111	9.06%	1090	88.98%
9	88	7.18%	1113	90.86%
10	72	5.88%	1129	92.16%
11	58	4.73%	1143	93.31%
12	47	3.84%	1154	94.20%
13	41	3.35%	1160	94.69%
14	31	2.53%	1170	95.51%
15	29	2.37%	1172	95.67%
16	26	2.12%	1175	95.92%
17	20	1.63%	1181	96.41%
18	19	1.55%	1182	96.49%
19	16	1.31%	1185	96.73%
20	12	0.98%	1189	97.06%
21	10	0.82%	1191	97.22%
22	8	0.65%	1193	97.39%
23	7	0.57%	1194	97.47%
28	6	0.49%	1195	97.55%
30	5	0.41%	1196	97.63%
32	3	0.24%	1198	97.80%
39	1	0.08%	1200	97.96%

Source: COMEXPERÚ - SUNAT

5.3.2.4 Number of Shipments prior to An Experimentation Round

Recall from Section 5.2 that my measure of *experimentation speed* is expressed as the number of shipments of product A necessary for a firm to decide to introduce product B into destination d. Besides, in my empirical approach shown afterwards, I am interested in evaluating how this measure responds to determinants such as trade liberalisation. Hence, in this stage I present some preliminary statistics on the number of shipments prior to each experimentation round occurred within my 2006-2013 sample.

Table 5.9 summarises the average number of shipments prior to the first ten experimentation rounds by a Peruvian firm in the USA market, joined by their respective frequencies, distinguishing between shipments to all destinations (Table 5.9(a)) and shipments to USA only (Table 5.9(b)). More importantly, I obtain for each subtable statistics for $pre-FTA$ and $post-FTA$ firms, as a first attempt to identify an effect of trade liberalisation on experimentation speed. It is convenient to stress that for experimentation round i by a firm, I consider the shipments the firm has made from round $i-1$ inclusively; while, in the case of the firm's first experimentation round, I take the shipments made everywhere since its foundation. This rule applies for the subsequent empirical approach as well.

Table 5.9: Peru-USA - Number of shipments prior to an experimentation round 2006-2013

pre-FTA vs. post-FTA firms (means and frequencies)

(a) Shipments to everywhere

Experimentation Round	Pre-FTA Firms	Post-FTA Firms	Total
1	13.38	11.46	12.43
	1225	1201	2426
2	25.3	14.34	19.8
	557	561	1118
3	28.7	20.06	24.38
	360	360	720
4	26.7	15.92	21.45
	273	260	533
5	22.41	15.36	19
	214	201	415
6	23.73	21.12	22.48
	174	161	335
7	23.74	19.84	21.86
	145	135	280
8	27.09	14.69	20.92
	112	111	223
9	23.92	21.01	22.56
	100	88	188
10	19.39	18.15	18.83
	88	72	160
Total	22.52	15.42	19.2
	4005	3527	7532

Source: COMEXPERÚ - SUNAT

(b) Shipments to USA

Experimentation Round	Pre-FTA Firms	Post-FTA Firms	Total
2	9.16	6.16	7.65
	557	561	1118
3	14.83	5.97	10.41
	360	360	720
4	9.01	6.15	7.62
	273	260	533
5	10.84	7.33	9.14
	214	201	415
6	10.38	7.88	9.18
	174	161	335
7	10.57	7.29	8.99
	145	135	280
8	12.15	7.32	9.74
	112	111	223
9	11.39	10.24	10.85
	100	88	188
10	11.97	9.19	10.72
	88	72	160
Total	9.25	5.17	7.34
	4005	3527	7532

Source: COMEXPERÚ - SUNAT

From my model's prediction, a tariff elimination on product B by market d should lead to a faster experimentation speed, expressed as fewer shipments of product A prior to experimenting with product B. Figures in Table 5.9 show that $post-FTA$ firms tend to introduce a new product into the USA market precisely after fewer shipments of their old products than $pre-FTA$ firms. This pattern is present across experimentation rounds, regardless of the order. Thus, $post-FTA$ firms tend to experiment faster than older firms in the USA market. This outcome may be taken as a first sign of the effect of trade liberalisation on experimentation speed.

However, the figures for $pre-FTA$ firms also embrace experimentation rounds occurring after the enactment of the Free Trade Agreement in 2009. Hence, in order to have a more transparent comparison, in Table 5.10 I remove those rounds from the analysis, ending up only with rounds by $pre-FTA$ firms occurring between 2006 and 2008, compared to rounds by $post-FTA$ firms. This exercise only considers the shipments to USA prior to an experimentation round to more closely replicate my theory.

Table 5.10: Peru-USA - Number of shipments to USA prior to an experimentation round by time of occurrence 2006-2013

pre-FTA vs. post-FTA (means and frequencies)

Experimentation Round	Pre-FTA	Post-FTA
2	6.27	6.16
	277	561
3	6.44	5.97
	166	360
4	5.01	6.15
	108	260
5	8.26	7.33
	73	201
6	8.61	7.88
	54	161
7	7.53	7.29
	43	135
8	9.66	7.32
	32	111
9	7.44	10.24
	27	88
10	5.05	9.19
	19	72
Total	4.64	5.17
	1605	3527

Source: COMEXPERÚ - SUNAT

The difference in terms of number of shipments gets narrower between $pre-FTA$ and $post-FTA$ firms, but there is still a tendency of faster experimentation speed for the latter. Note that for further rounds, that difference is reversed in favour of $pre - FTA$ firms. This preliminary outcome may imply that the boost on experimentation speed by trade liberalisation takes place mostly at the initial stages of firms' experimentation process in the USA market; and, before moving further by introducing new products, $post - FTA$ firms opt for taking advantage of the realised demand from the USA market, by shipping more of their already introduced goods.

5.3.2.5 Export Values and Preference Regimes

It is important to point out that, prior to the enactment of the USA-Peru Free Trade Agreement, several Peruvian 8-digit lines had tariff-free access to the USA market by unilateral trade preferences from that country, under the ATPDEA and zero-MFN schemes. The next two tables group the rounds of new exports according to their inclusion or not of at least one product favoured by either of those regimes. Table 5.11 exclusively focuses on the first exports by each of the 2,426 firms; while Table 5.12 covers all the 7,532 experimentation rounds in the sample.

The figures in Table 5.11 reveal that 63.27% of firms in the sample have started their experience in the USA market with either an ATPDEA or zero-MFN product. However, the amount of experimentation rounds comprising only products with no pre-FTA unilateral trade preference is also remarkable. In my whole sample, as shown in Table 5.10, 51.35% of experimentation rounds by firms include at least one product affected by one of the aforementioned regimes before the FTA was effective.

Table 5.11: Peru-USA - Firms' First Experimentation Rounds per Preference Regime 2006-2013

New ATPDEA product to USA on day t	New MFN product to USA on day t		
	No	Yes	Total
No	891	534	1425
Yes	668	333	1001
Total	1559	867	2426

Source: WITS - World Bank

Table 5.12: Peru-USA - Experimentation Rounds per Preference Regime 2006-2013

At least one new ATPDEA product to USA on day t	At least one new MFN product to USA on day t		
	No	Yes	Total
No	3664	1206	4870
Yes	1622	1040	2662
Total	5286	2246	7532

Source: WITS - World Bank

Briefly looking at daily exports by Peruvian firms to USA during 2006-2013, I constructed some Kernel densities of the log of a firm's total exports to that market on day t, considering only those days in which firms undertook an experimentation round, also taking into account that in those days –except for the first exports– firms may have exported both new products and other goods the firm previously sold to USA. Figures 5.1 and 5.2 display those densities for all the 7,532 experimentation rounds in the sample, and only the 2,426 first new exports, respectively. This exercise shows that export values by $post - FTA$ firms tend to be larger than those by older firms. Furthermore, focusing on Figure 5.2, the initial value with which $post - FTA$ firms jump into the USA market is usually larger than for $pre - FTA$ firms. While the latter on average start with a US \$ 21,568 shipment, the former do it with a mean value of US \$ 28,530.

Figure 5.1

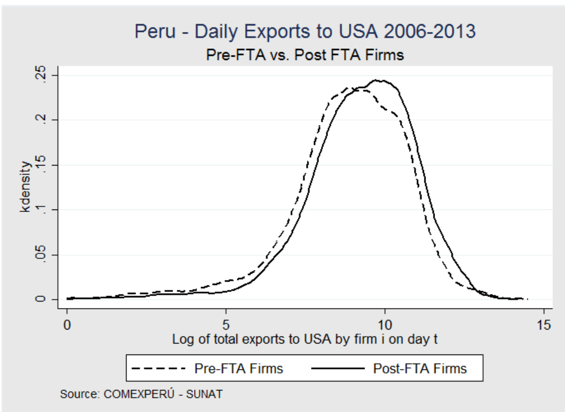
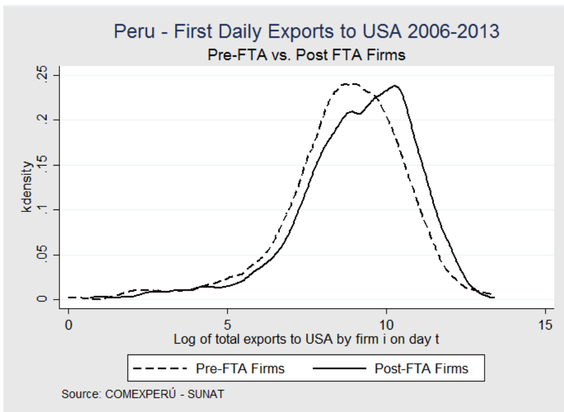


Figure 5.2



As a complement to the numbers in Tables 5.11 and 5.12, Figure 5.3 plots the Kernel densities of the pre-FTA weighted average tariff rate on a firm's exports to USA on day

t, again only considering the days an experimentation round occurs on.[41] The histogram refers to the mean tariffs for all products sold by a firm on an experimentation round (both new and old products); whereas the black line takes the mean for only the new products sold on that day. The two weighted averages are very similar, with an overall mean between 7.9% and 8.6% per firm/day; but 14.04% of the experimentation rounds comprise only zero-tariff new products, under the zero-MFN scheme.

Figure 5.3

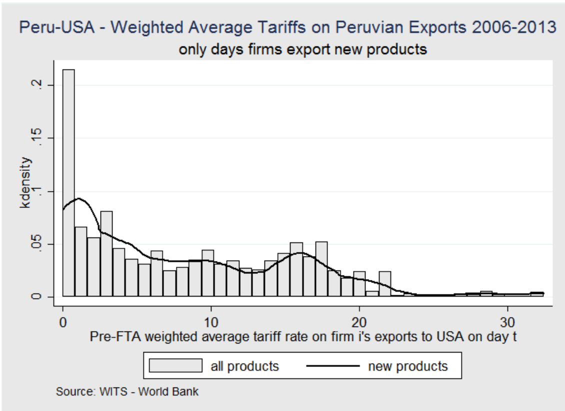
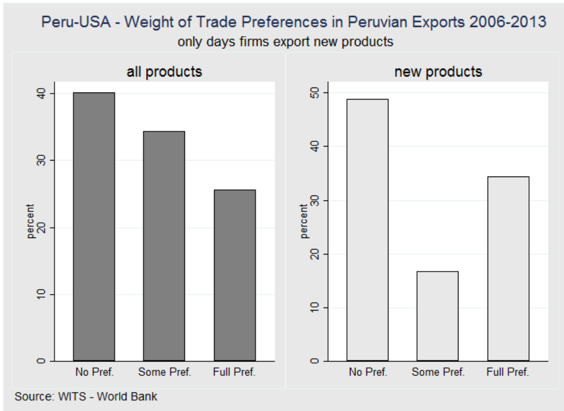


Figure 5.4



That last information makes it pertinent to analyse the share, in terms of export values, of products under a USA pre-FTA trade preference –be it ATPDEA or zero-MFN– on a day a firm experiments with new products. Figure 5.4 plots the densities of the weight of those preferences in firm i's exports to USA on day t, showing the vast majority of experimentation rounds comprise only new products with no preference at all (48.80%) or only fully liberalised products (34.39%). These preliminary findings must be taken into account for the survival analysis presented in the next section.

[41] Tariff rates are weighted by the export value of each product sold on day t.

5.4 Survival Analysis

My main interest is to test the main prediction from my theoretical model: whether trade liberalisation, in the shape of the tariff elimination on Peruvian goods exported to USA under the 2009 Free Trade Agreement, plays a facilitating role for experimentation. I am also interested in assessing a potential role of the size of export shipments prior to firms' experimentation rounds. One convenient approach is to characterise how long it takes for a Peruvian firm to introduce one or more new products into the USA market; namely, Peruvian firms' experimentation speed in that destination; and the main determinants of that speed.

To attain that outcome, I undertook a survival analysis which calculates the well-known Kaplan-Meier Survival Function. The innovation in this analysis, as opposed to most studies that consider as a failure the event of a firm leaving an export market or even dropping out of the export activity, is that the "failure" I assess is the event in which a Peruvian firm sells one or many new products to the USA market, i.e. the occurrence of an experimentation round. It should be kept in mind that a product is taken as "new" at the firm-destination level. That is, a product is new if The firm has never exported it to USA before.

Econometrics textbooks like Cleves et al. (2010) report that the Kaplan-Meier Estimator is a nonparametric estimate of the survival function, denoted as $S(t)$. That estimate, also known as the product limit estimate of $S(t)$ at any time t is defined as:

$$\hat{S}(t) = \Pi_{j|t_j \leq t}(\frac{n_j - d_j}{n_j}), \tag{5.15}$$

where n_j is the number of observations at risk at time t_j, and d_j is the number of failures at such t_j. This function is a product considering all j times there is a failure, both before and at time t. As a result, the estimate of the failure function is the complement of the estimated survival function: $1 - \hat{S}(t)$.

The basic way to interpret the Kaplan-Meier Estimator is: at day t, what is the probability for firms to introduce one or more new products into USA (failure)? Alternatively, at day t, what is the probability for firms not to experiment in USA with any other new product (survival)? The time span is measured in days, depending on the order of the experimentation round. For instance, for the first new exports by a firm to USA, I count the number of days since the firm was established. For the second experimentation round, in contrast, I count how many days have elapsed since the firm's first products sold to USA. That latter rationale is applied for the subsequent rounds. Note that the analysis considers the right censored firms lost in each round, as well as those that never exported to USA during the 2006-2013 period.

5.4.1 Pre-FTA vs. Post-FTA Firms

For the first Kaplan-Meier analysis, I split the sample of 7,806 firms according to their year of foundation, leading to 3,053 firms starting between 2006 and 2008 –$pre - FTA$ firms– and 4,753 founded between 2009 and 2013 –$post - FTA$ firms–. The outcomes are striking.

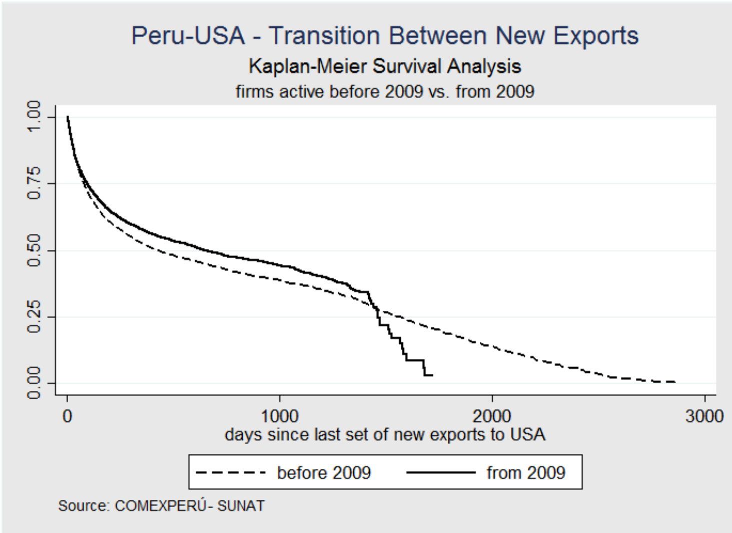
Figure 5.5 provides an overall comparison of the Kaplan-Meier Survival Function between both types of firms, considering the pool of experimentation rounds, regardless of the order and the firm. The observations "at risk" are the number of days elapsed since the previous experimentation round of a firm. The dashed line shows the function for the experimentation rounds by $pre - FTA$ firms; whereas the solid line is the equivalent for $post - FTA$ firms.

This figure shows that, overall, experimentation rounds by $pre-FTA$ firms take shorter periods to effectively occur than by $post - FTA$ firms. More precisely, the probability for $pre - FTA$ firms of introducing one or more new products into the USA market rises to 50% 423 days after their previous experimentation round; while that probability is reached at 646 days for $post - FTA$ firms. Similarly, the "failure" probability becomes 25% at 79 days for $pre-FTA$ firms; while for $post-FTA$ firms, that likelihood is reached at 95 days. This might indicate that $pre - FTA$ firms tend to experiment faster than $post - FTA$ firms; however, after 1,500 days approximately, the survival probability for $post - FTA$ firms becomes lower.[42] The results also indicate that there is one $post - FTA$ firm which, 1,718 days after its last experimentation round, has not introduced any other products up to the end of the sample, leading to a final survival probability of 2.86%. As for $pre-FTA$ firms, the survival probability becomes zero after 2,862 days, meaning that all the time spells "at risk" concluded with an experimentation round in the USA market, with many

[42]This is likely to be explained by two factors: (1) the longer existence of $pre - FTA$ firms; and (2) the imposed 3-year threshold for firms that never exported to USA. The latter is more relevant for $post-FTA$ firms as we can only observe them between 2009 and 2013. Hence, fewer $post - FTA$ firms remain in the sample after removing those never selling to USA, affecting the probability function.

other time spells became right-censored in between.[43]

Figure 5.5



However, I consider it much more informative to estimate the survival probability separately for each experimentation round, so that the interpretation can be done at the firm level, i.e. what is the probability for a firm to undertake a first experimentation round in the USA market, a second one and so forth. Thus, Figure 5.6 presents the results for each of the first four rounds of new exports. The pattern observed in Figure 5.5 is exhibited in Figure 5.6(a) for first experimentation rounds. This time, both estimates of the survival function follow the same path; but the survival probability for $post - FTA$ firms drops at a faster pace from day 1,424. For $post - FTA$ firms, the probability of experimenting for the first time in USA becomes 50% at 1,419 days after the firm was founded, while that length was 1,391 days for $pre - FTA$ firms. For the reason exposed earlier, the survival probability becomes zero –the probability of exporting for the first time to USA becomes one– after 1,682 days for $post - FTA$ firms and 2,862 days for $pre - FTA$ firms.

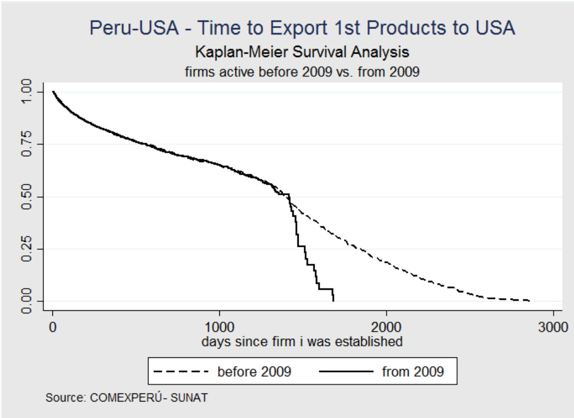
In the next three graphs, a trend in favour of $post - FTA$ firms becomes evident. Figure 5.6(b), only considering firms that exported for a first time to USA, indicates that the probability of experimenting with a second consignment of new products in the USA market becomes 50% for $post - FTA$ firms 226 days since their first export; whereas that length for older firms is 339. Another way to interpret those results is: at day 500 since

[43] A time spell becomes right-censored if a firm never exports to USA or no longer sells any other new product to USA. The date considered to close that time spell is either the day the firm closed down or the last date the firm sold any product to any other destination in my sample.

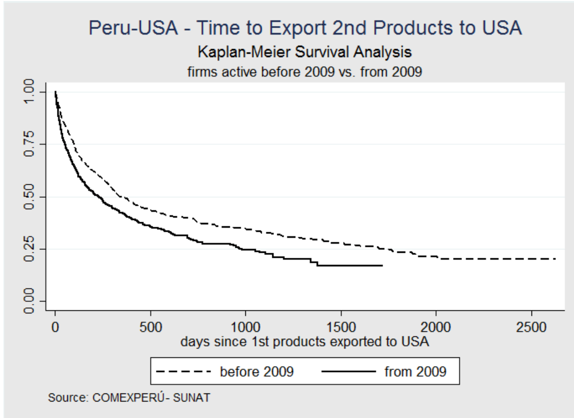
their first export to USA, the probability of having experimented for a second time there is about 57% for $pre - FTA$ firms; and almost 65% for newer firms. Moreover, there is a maximum 83.12% probability for $post - FTA$ firms to experiment for a second time, attained at 1,718 days; while that maximum likelihood is just 79.98% for incumbents, at 2,628 days. Even though both types of firms take less time to undertake a third or fourth experimentation rounds, Figures 5.6(c) and 5.6(d) confirm that $post - FTA$ firms are faster. The contrast with Figure 5.5 is arguably explained by the longer existence of $pre - FTA$ firms, which were able to make up to 67 experimentation rounds, compared to the maximum of 39 for new firms.

Figure 5.6: Kaplan-Meier Survival Analysis Pre- vs. Post-FTA Firms: 1st to 4th Experimentation Rounds

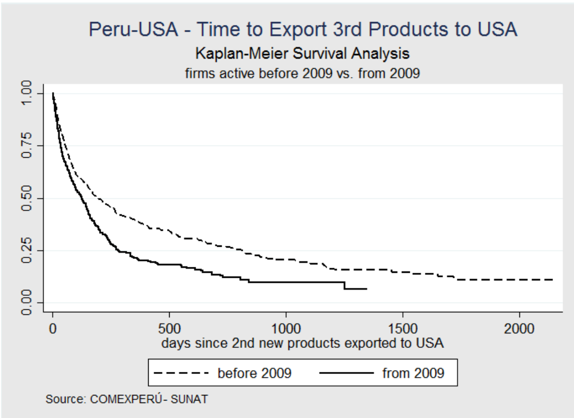
(a)



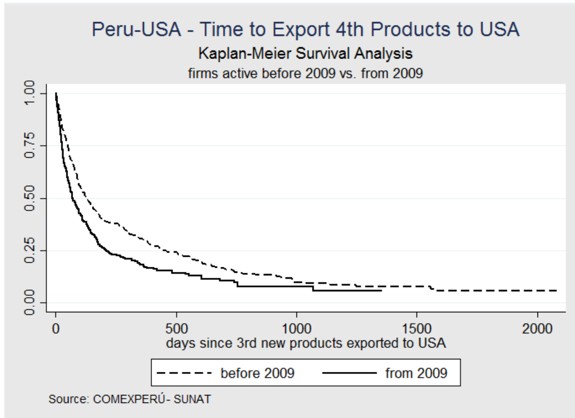
(b)



(c)



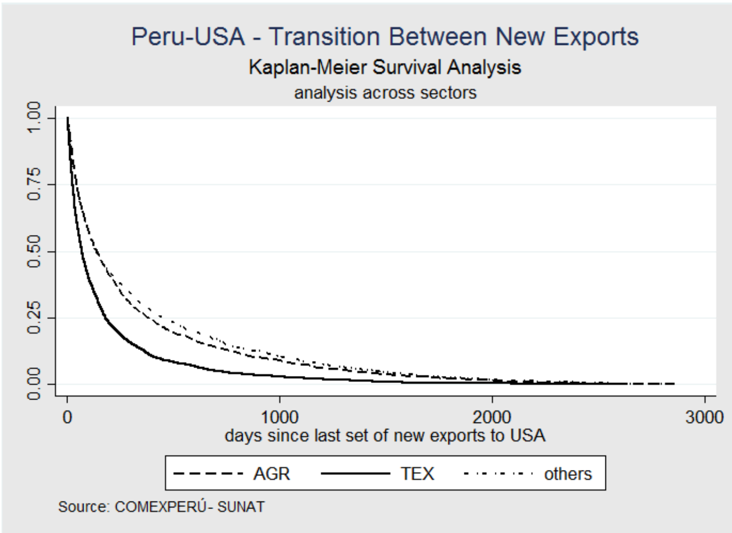
(d)



5.4.2 Analysis Across Sectors

Another survival analysis distinguishes between the sectors the 8-digit lines exported belong to. Figure 5.7 presents the Kaplan-Meier estimator for all experimentation rounds in the sample, according to the three sectoral groups constructed earlier. Overall, sets of new exports embracing textile and apparel products –solid line– take place faster than agricultural exports –dashed line–, and other manufacturing industries –dotted line–. Note that, since I compare the span lengths between sectors –how long it takes to introduce products from a particular sector–, it is impossible to control for right-censored firms in this estimation.

Figure 5.7



When looking at each round separately, Kaplan-Meier estimations –not reported in this chapter– reveal that agricultural first exports tend to be faster than those from other sectors; but from the second round onwards, textile and apparel new exports take fewer days than the rest.

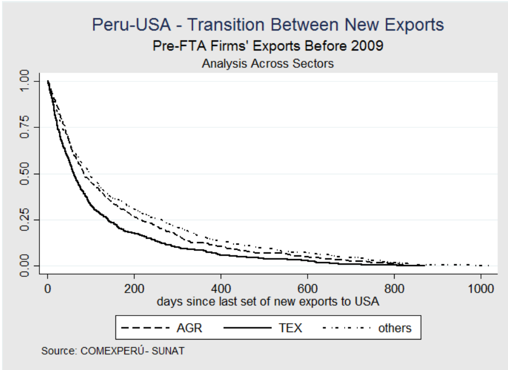
In order to better assess the findings from this exercise, I combined the analysis across sectors with the pre-FTA vs. post-FTA criterion. But I consider it more informative to split the experimentation rounds by $pre-FTA$ firms between rounds before and after 2009, so as to identify a clearer role of trade liberalisation. Figure 5.8 presents a set of nine graphs with the results from the criteria combination. The first row shows the overall analysis for all experimentation rounds; the second one, only the first exports; and the third one, the second round. The first column considers the new exports by $pre-FTA$ firms done before 2009; the second column takes those made by such firms since the FTA;

and the third one works with all $post - FTA$ firms.

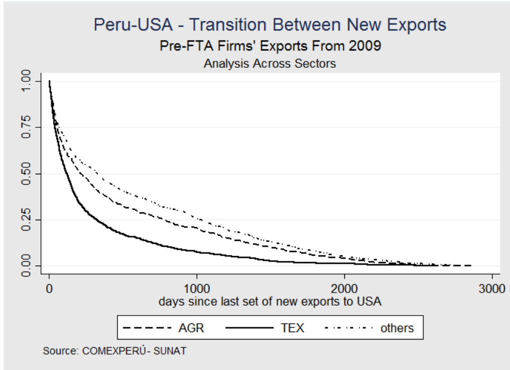
The dynamics previously described of experimentation across sectors are still evident in this estimation. What is most remarkable, looking at the second row of first exports, is that the argued faster experimentation speed by agricultural exports is mostly explained by pre-FTA transactions (Figure 5.8(d)) and, to a much lesser extent, transactions by $post-FTA$ firms (Figure 5.8(f)). In the case of post-FTA transactions by $pre - FTA$ firms (Figure 5.8(e)), it is textile exports that are effectively faster, just like in subsequent rounds. This outcome may imply a particular boost for textile exports by the Free Trade Agreement, especially for firms that, prior to the FTA, depended on the ATPDEA trade preferences given by USA to many textile exports, and were not certain about the renewal of those preferences. Also, some textile products were levied with very high tariffs, meaning that, with the elimination of those tariffs since 2009, it is much easier to export these products, in a shorter time span, which matches my theoretical approach.

Figure 5.8: Kaplan-Meier Survival Analysis Pre- vs. Post-FTA Firms: Analysis Across Sectors

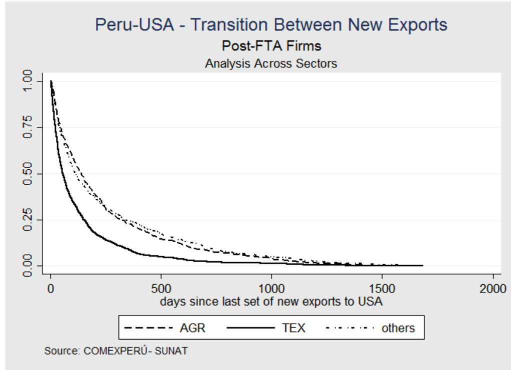
(a)



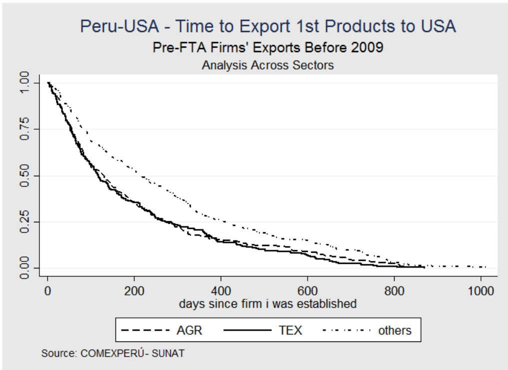
(b)



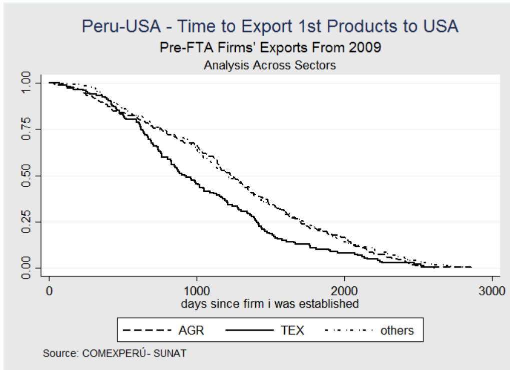
(c)



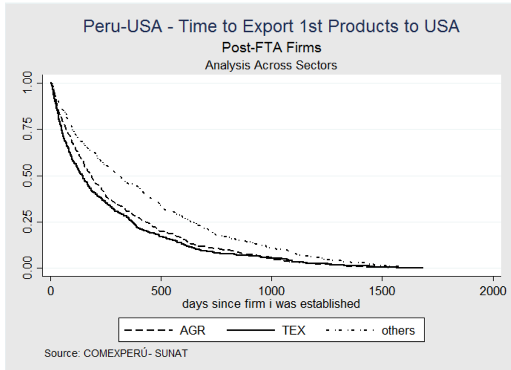
(d)



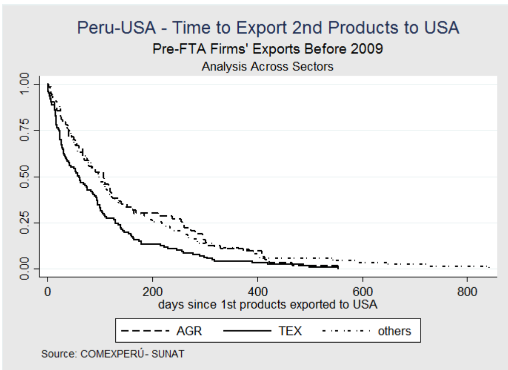
(e)



(f)



(g)



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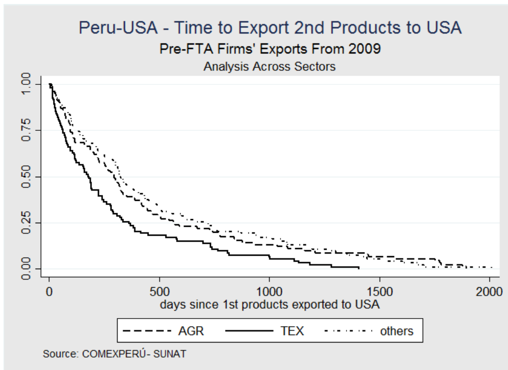
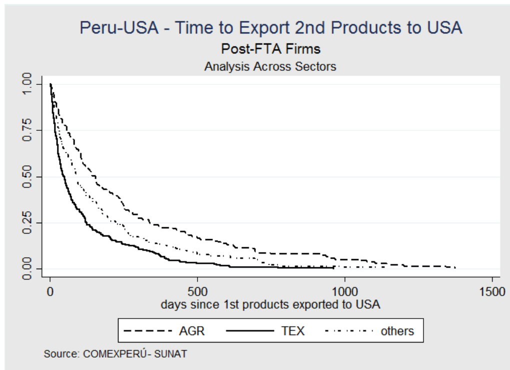


(i)



5.4.3 Exporting One or Many New Products

One approach to address the role of firm size and experience in the dynamics of experimentation by Peruvian firms in USA market is to compare the experimentation speed between rounds composed by one single new product and those comprising sets of many new products. Recall from the summary statistics that 64.6% of experimentation rounds comprise only one single product.[44]

Figure 5.9 portrays the overall results of this exercise, showing that the time lapsed to experiment with more than one new product to USA tends to be shorter. In fact, the survival probability for experimentation rounds involving many products becomes 50% at 82 days after the firm's previous experimentation; whereas that number is 107 for one-product rounds. These results might entail qualitative differences between firms able to introduce many products at once and those only able to introduce one, meaning that the former tend to be stronger and better-performing than the latter.

Figure 5.9

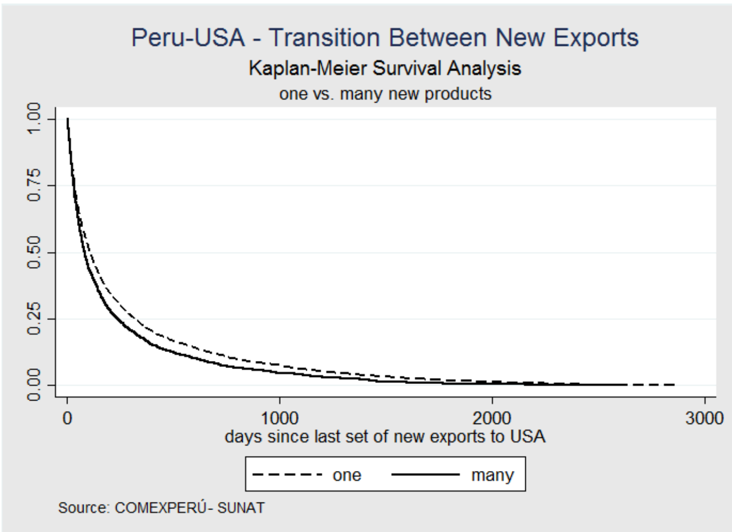


Figure 5.10, like in the analysis across sectors, distinguishes between $pre-FTA$ and $post-FTA$ transactions. The trend described earlier is almost omnipresent. However, two striking features can be identified. Firstly, for $post-FTA$ transactions by $pre-FTA$ firms –the second column– the speed difference in favour of many-product experimentation rounds gets much larger, compared to the first column, where speeds are fairly similar between both groups. Secondly, for $post-FTA$ firms, the speed difference tends to be

[44] Like in the analysis across sectors, this exercise cannot control for right-censored firms: there is no chance for censoring across products.

smaller, and even gets reversed in the third experimentation round, in favour of one-product rounds. Further experimentation rounds by $post - FTA$ firms, not presented herein, have quite similar speeds across both categories.

I can interpret these findings as follows: trade liberalisation plays a determinant role for both $pre - FTA$ and $post - FTA$ firms, which are encouraged to take more advantage of this condition by exporting more new products to USA more rapidly, presumably their core competence products; and the fact that such effect is stronger for $pre - FTA$ firms may be a sign of the role of size and experience in the USA market and, more importantly, an additional incentive for those firms to more easily experiment with more products, previously levied with a tariff.

Figure 5.10: Kaplan-Meier Survival Analysis Pre- vs. Post-FTA Firms: One vs. Many Products Exported

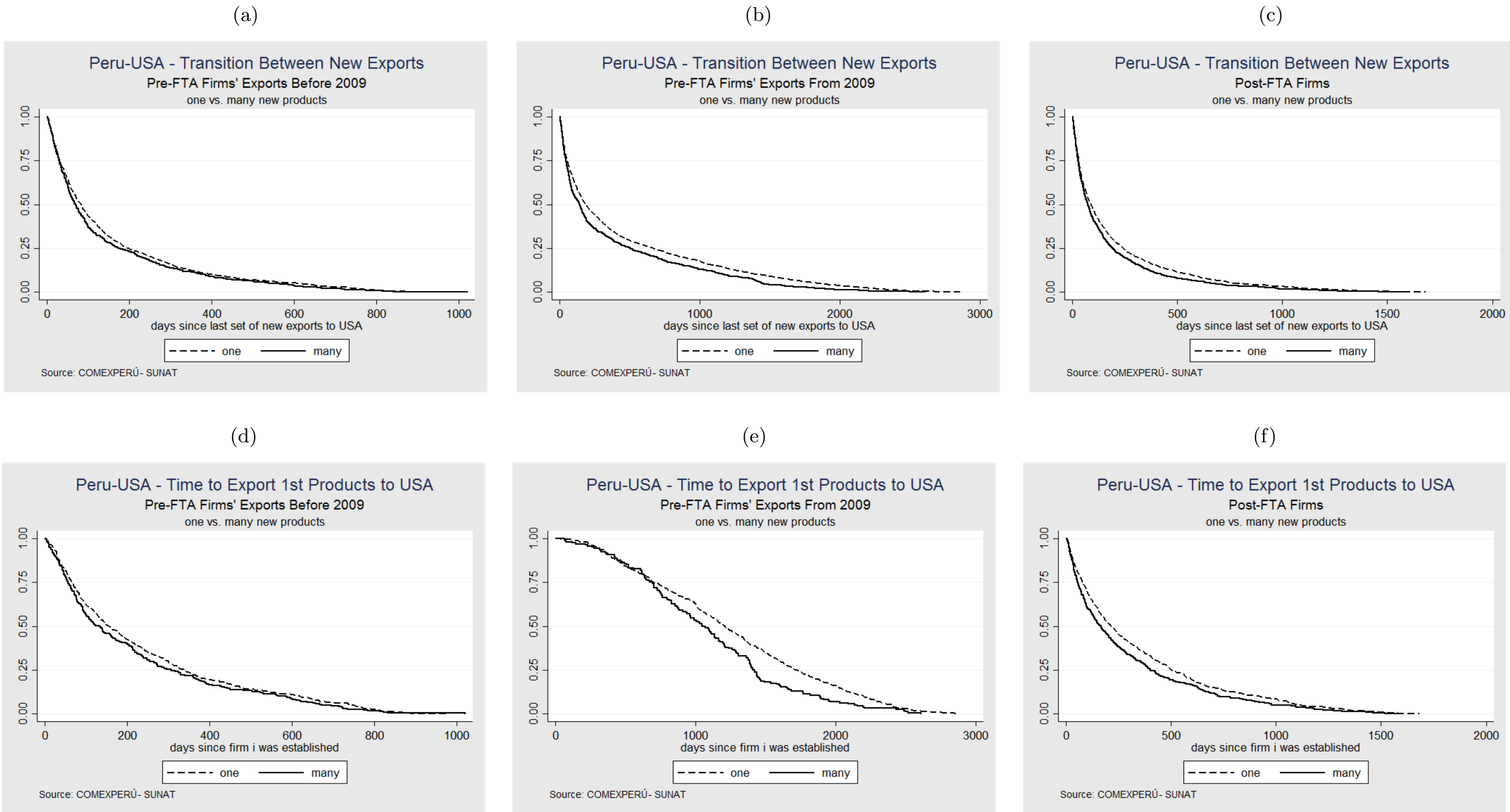
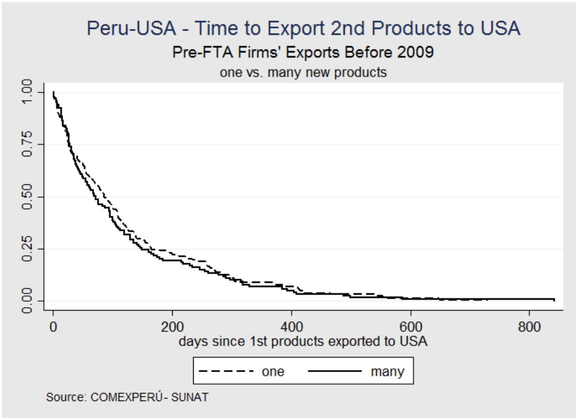
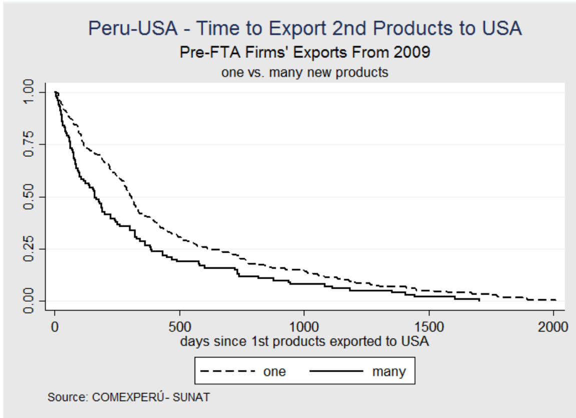


Figure 5.10 (Cont.): Kaplan-Meier Survival Analysis Pre- vs. Post-FTA Firms: One vs. Many Products Exported

(g)



(h)



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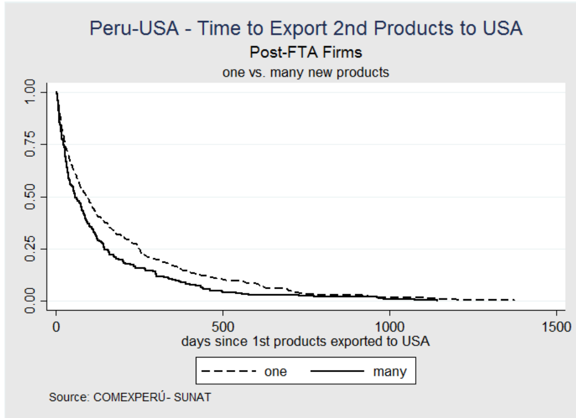
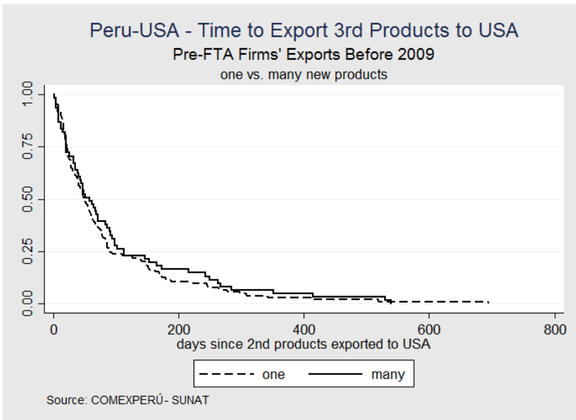


(j)



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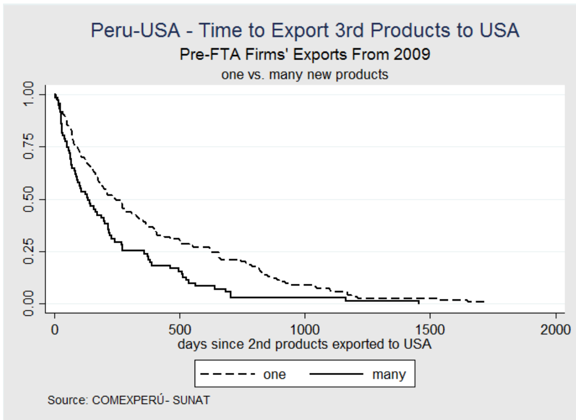

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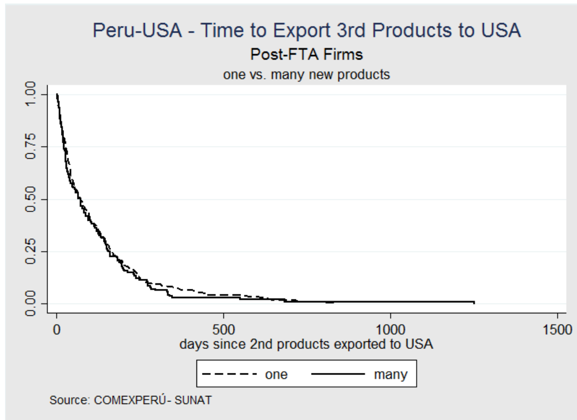


5.4.4 Analysis Across Mean Export Values

My theoretical model predicts that the number of shipments of product A by a firm to country d prior to the introduction of B is inversely related to the firm's mean of the perceived demand of product A. Thus, I test this prediction with a Kaplan-Meier survival analysis on the experimentation speed across quintiles of the mean export value of shipments by a Peruvian firm prior to a new experimentation round in the USA market, as a proxy for the mean perceived demand of products previously introduced. The exercise separately utilises shipments to USA only and to all destinations.

5.4.4.1 Mean Exports to USA

In this first estimation, I obtain quintiles of the mean values of shipments by Peruvian firms to USA, from its first shipment of product A inclusively, to the last one before the introduction of product B. The same rule applies for all subsequent experimentation rounds. The mean export quintiles are as follows:

- First quintile: mean export value of up to US \$ 662.
- Second quintile: above US \$ 662 and up to US \$ 2,379.
- Third quintile: above US \$ 2,379 and up to US \$ 6,542.35.
- Fourth quintile: above US \$ 6,542.35 and up to US \$ 20,625.50.
- Fifth quintile: above US \$ 20,625.50.

Each graph elaborated in this analysis shows five step lines, each of them representing one of the mentioned quintiles.

Figure 5.11 compiles all experimentation rounds, regardless of the firm; while Figure 5.12 focuses on the second new products exported to USA per firm. Recall that, since I work with the previous shipments to USA, the first experimentation rounds are excluded from this exercise.

Figure 5.11 shows that introductions of new products to USA preceded by small mean shipment values tend to occur faster than experimentations following larger mean export values. Thus, for the first quintile function –the solid grey line– the experimentation probability becomes 50% at day 56 since last experimentation round. Conversely, for the last quintile function –the solid black line–, that probability is attained at day 254.

Figure 5.12 on the introduction of the second new products to USA portrays a common pattern that will be more clearly seen in the forthcoming graphs: there is a growing difference in survival/failure probabilities between experimentation rounds from the first three quintiles and the last two, embracing mean exports above US \$ 6,542.35. Introduction of second new exports preceded by average shipments up to US \$ 6,542.35 take a shorter span than experimentation rounds occurring after mean exports above that value.

These findings appear to go against my theoretical prediction. However, differences between $pre - FTA$ and $post - FTA$ transactions may provide further information.

Figure 5.11

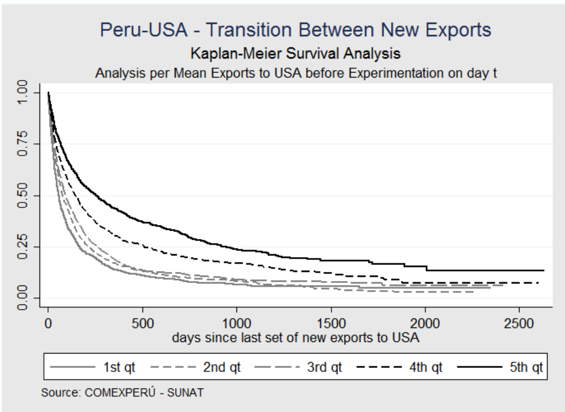
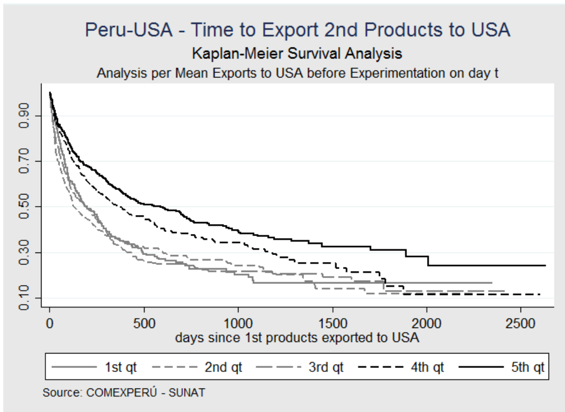


Figure 5.12

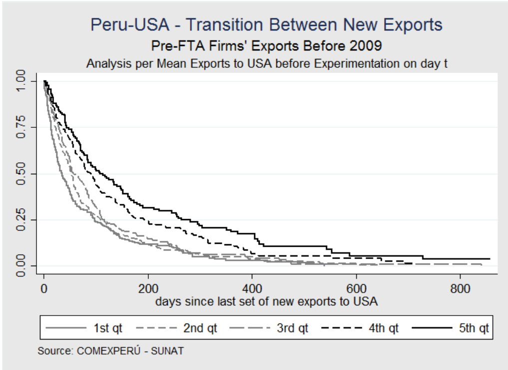


Indeed, when observing the Kaplan-Meier estimations in Figure 5.13 and comparing the trends of the functions between $pre - FTA$ transactions –the first column– versus $post - FTA$ experimentation rounds –the next two columns–, it is evident that the gap between the first three quintiles and the last two is much larger for $post-FTA$ transactions.

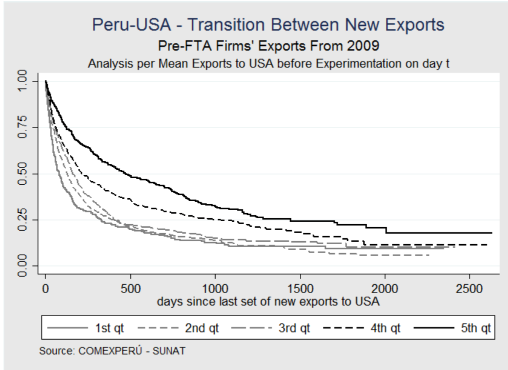
The first column shows that the survival functions for all quintiles are closer to each other, at least at value 0.5 in the vertical axis, especially in Figure 5.13(g) for the third round of new exports. Conversely, when looking at $post - FTA$ transactions, principally Figures 5.13(h) and 5.13(i) for third new exports, the probability of experimentation for the first three quintiles becomes increasingly larger than for the last two. This finding may provide a valuable implication on the role of trade liberalisation. Since 2009, when most tariffs were eliminated, Peruvian firms, especially the smallest ones, may have a chance to realise the USA demand for their products more easily, by shipping smaller values of their products, i.e. starting small. I can also relate these estimation results with Equation 5.14b of my theoretical model, which indicates a flatter negative slope of the cutoff number of shipments for larger mean export values. This may be translated into relatively lower experimentation speed for larger sales, which is the general tendency of my estimates.

Figure 5.13: Kaplan-Meier Survival Analysis per Quintiles of Mean Exports to USA Before Experimentation on Day t

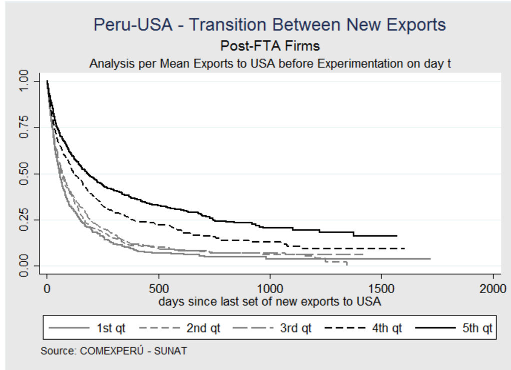
(a)



(b)



(c)



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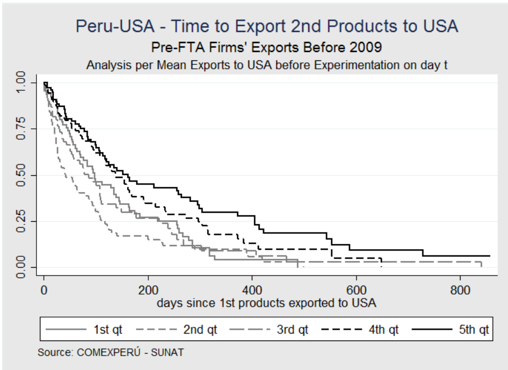

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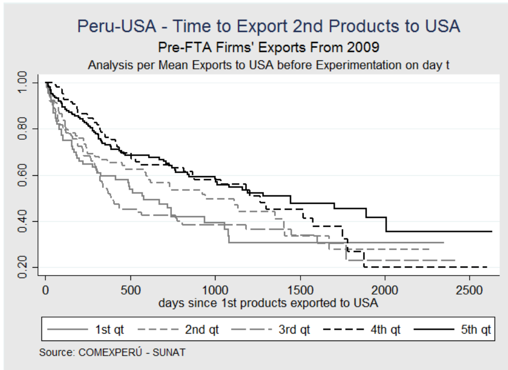
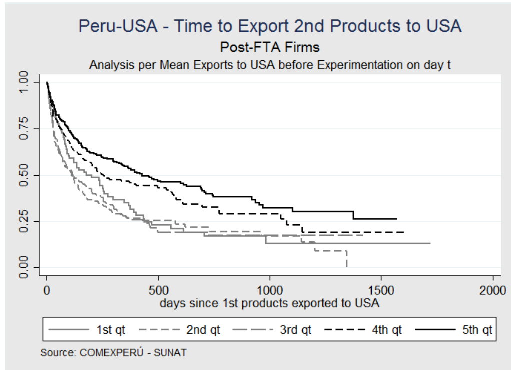
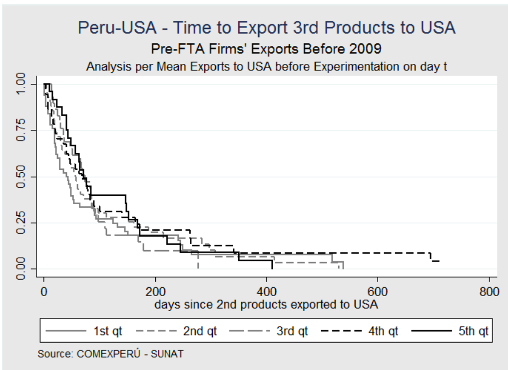


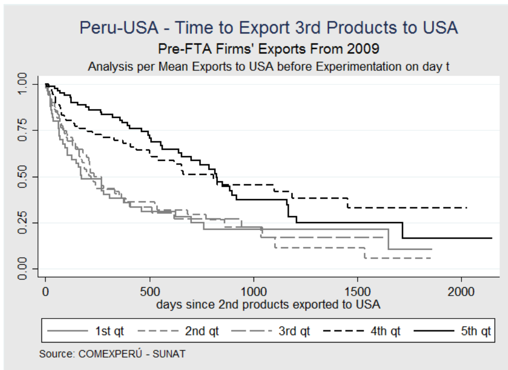
(f)



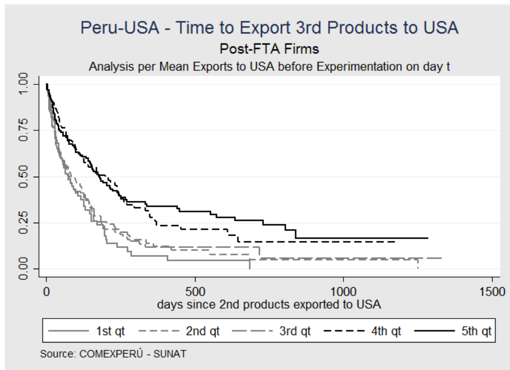
(g)



(h)



(i)



5.4.4.2 Mean Exports to All Destinations

I also prepared a similar exercise, but working with the firm's mean value of shipments to everywhere, including USA. This may provide valuable information on experimentation speed by Peruvian firms, especially for the introduction of their first new products to that market.

Similarly, I constructed quintile values for firms' mean shipments to any destination, obtaining the following numbers:

- First quintile: mean export value of up to US $ 308.23. This group includes experimentation rounds in USA with no previous exports anywhere (zero mean export value).
- Second quintile: above US $ 308.23 and up to US $ 2,148.74.
- Third quintile: above US $ 2,148.74 and up to US $ 6,954.26.
- Fourth quintile: above US $ 6,954.26 and up to US $ 22,452.89.
- Fifth quintile: above US $ 22,452.89.

This analysis gives as interesting results as the previous one. Figures 5.14 and 5.15 show the overall results for all experimentation rounds and the first new exports, respectively. I am particularly interested in the outcome from Figure 5.15. On the one hand, it is evident that the introduction of a first product to USA preceded by tiny or no shipments to any other destination –the solid grey line– takes place in a much shorter time span since the firm's foundation than the first experimentations from the other quintiles. This is a sign of the existence of Peruvian firms exclusively focused on the USA market. Indeed, most débuts in USA from the first quintile correspond to firms without any export experience elsewhere.

On the other hand, after the first quintile, the group with the highest experimentation speed is the fifth quintile –the solid black line–, embracing firms with the largest mean export values. This last pattern can be more clearly observed when distinguishing between $pre-FTA$ and $post-FTA$ transactions.

Figure 5.14

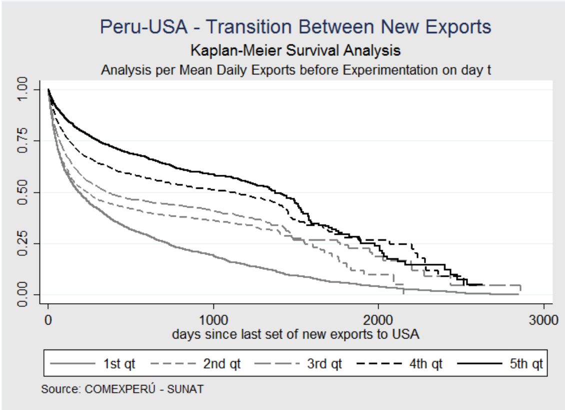
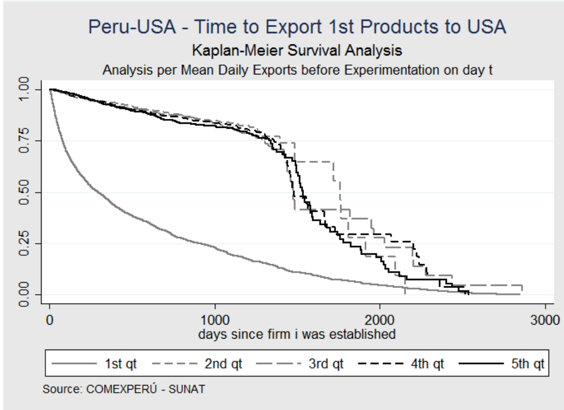


Figure 5.15



That exercise, performed in Figure 5.16, effectively confirms in the second row that the experimentation speed, measured in days since the firm was established, is highest for firms with almost exclusive focus on the USA market. That speed gap between the first quintile and the rest gets exacerbated for $post - FTA$ firms, as Figure 5.16(f) shows.

The second pattern identified, the particularly high probability of experimenting for the first time in USA by firms from the last quintile of mean exports everywhere, is more evident for $pre - FTA$ rounds in Figure 5.16(d). And that difference between the largest exporters and the 2nd-4th quintiles fades for $post - FTA$ transactions, shown in Figures 5.16(e) and 5.16(f). The gap in experimentation speed at $post - FTA$ transactions between quintiles 1-3 and quintiles 4-5, identified in the previous subsection, is evident for second experimentation rounds, exhibited in Figures 5.16(h) and 5.16(i).

With the results obtained from this survival analysis across mean export values prior to the introduction of new products to USA, I can extract some stylised facts on experimentation speed and the role of trade liberalisation.

1. For the first experimentation rounds in USA, except for Peruvian exporters exclusively focused on the USA market, there is a negative relation between experimentation speed and the mean value of shipments everywhere, especially before the FTA enactment. That advantage in favour of larger exporters is diminished once the FTA comes into effect.

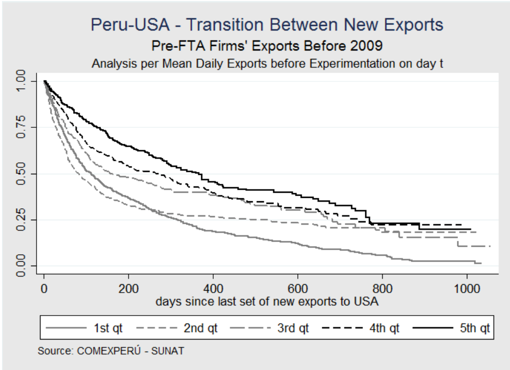
2. For subsequent experimentation rounds, Peruvian firms that previously sold smaller values of products either to USA only or everywhere, tend to introduce new products to USA at a faster speed than those exporting larger previous shipments. That difference gets much larger after the enactment of the USA-Peru Free Trade

Agreement. This implies that trade liberalisation is associated with quicker experimentation by firms in the USA market after sending smaller shipments, which now provide information on the perceived demand for their products more effectively.

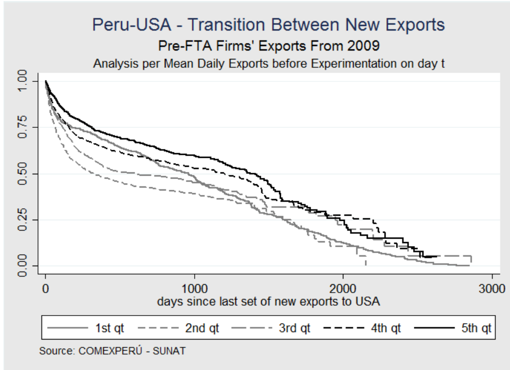
These two stylised facts identified can be summarised into one main finding from this survival analysis: the USA-Peru FTA enhances experimentation, making smaller Peruvian exporters introduce products faster into the USA market.

Figure 5.16: Kaplan-Meier Survival Analysis per Quintiles of Mean Exports Everywhere Before Experimentation on Day t

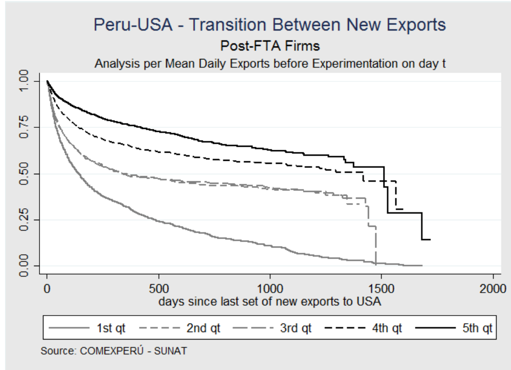
(a)



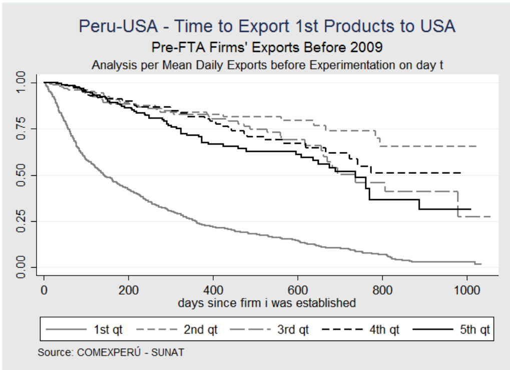
(b)



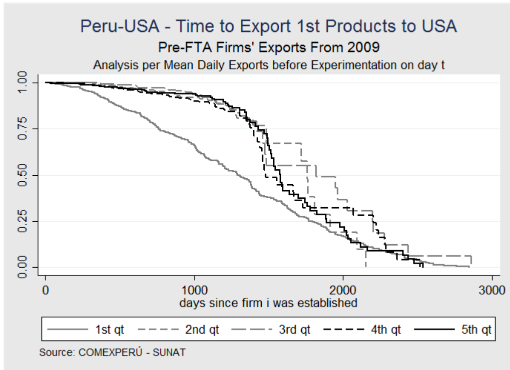
(c)



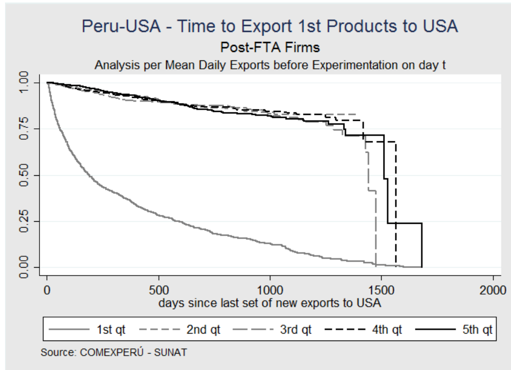
(d)



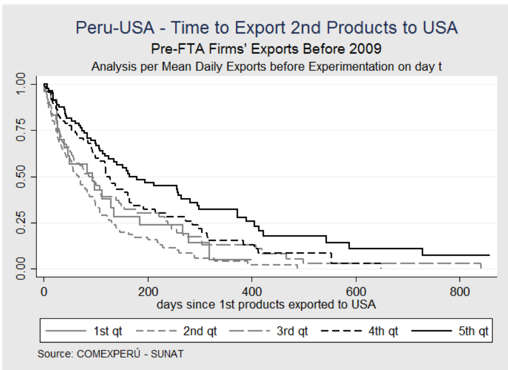
(e)



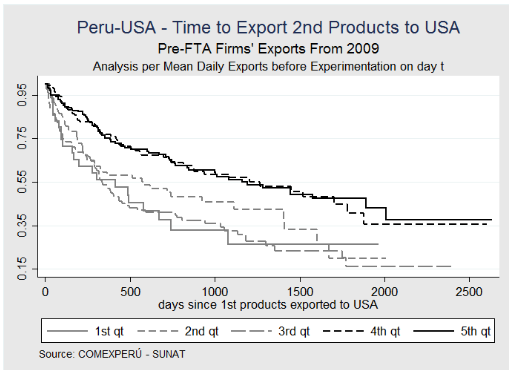
(f)



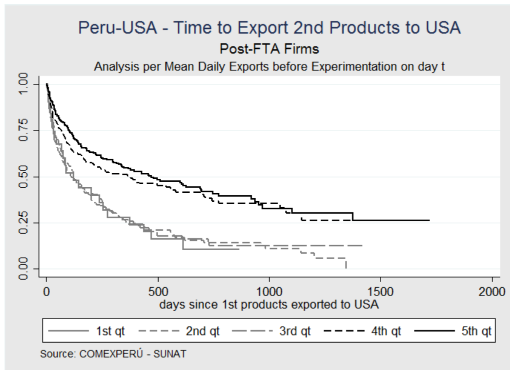
(g)



(h)



(i)



5.4.5 Analysis Across Tariff Rates and Preference Regimes

In this next stage of the survival analysis, I am interested in knowing the number of days taken by firms to experiment in the USA market, depending on the mean pre-FTA tariff rate levied by that country and whether these products enjoyed a USA trade preference regime prior to the enactment of the Free Trade Agreement. The trade preferences regimes addressed are the Andean Trade Preference and Drug Eradication Act (ATPDEA) and the zero tariff rates under the WTO Most Favoured Nation (MFN) regime.

5.4.5.1 Analysis Across Weighted Average Tariffs

As we know, since 2009 the vast majority of products were automatically liberalised (zero tariff). Hence, for the tariff-based analysis to be done, I decided to calculate for each experimentation round a pre-FTA weighted average tariff rate, where the weight is the US $ export value of each product, defined at the 8-digit level.

I constructed two types of weighted average tariffs: 1) one for all the products sold by a firm on day t; and 2) another one for only the new products introduced by the firm on day t. In this paper, I present the results from the second type, as my main focus is on the new exports.

For the effects of the calculation of the Kaplan-Meier survival estimator, I obtained the quintiles of the weighted average tariffs, which are as follows:

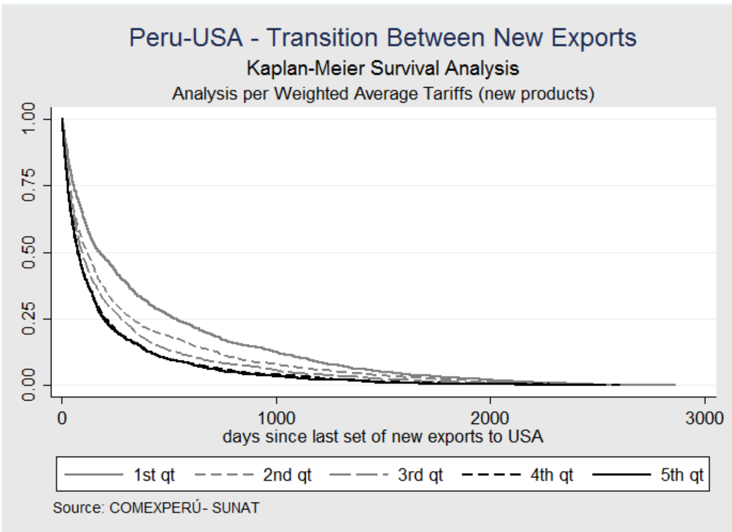
- First quintile: up to 0.279%, mostly accounting for new products with zero MFN tariff.
- Second quintile: above 0.279% and up to 3.07%.
- Third quintile: above 3.07% and up to 7.34%.
- Fourth quintile: above 7.34% and up to 14.9%.
- Fifth quintile: above 14.9%.

Similar to the mean export analysis, all graphs provided show five step lines, each representing one quintile.

Figure 5.17 displays the outcome from this exercise, including all experimentation rounds, regardless of the order and the firm. It is clear from this figure that it usually takes a shorter time spell for firms to experiment in USA with products which pre-FTA weighted average tariff belongs to the 4th –the dashed black line– and, especially, the 5th quintile –the solid black line–. In numbers, firms are faster to export new goods with an over 7.34% pre-FTA weighted average rate. On the contrary, firms take much longer to export new products from the 1st quintile, namely, those with zero MFN tariffs. A potential explanation for this is that experimentation with those liberalised products had already occurred before the start of my sample. It must be pointed out, nevertheless, that products from such 1st quintile are more quickly exported by firms in further rounds, even quicker than products from the top quintiles.

This first finding may imply an opposite result compared to the basics of my sequential exporting theory, which stated that, between two types of products, the firm would experiment with the one with the lowest trade cost. However, it might be the case that firms have already experimented with products with the lowest tariffs much earlier than the start of my sample. Moreover, recall that some of the tariff lines exported before the 2009 FTA, from either the lowest or highest quintiles, enjoyed a zero tariff under the ATPDEA regime by USA.

Figure 5.17



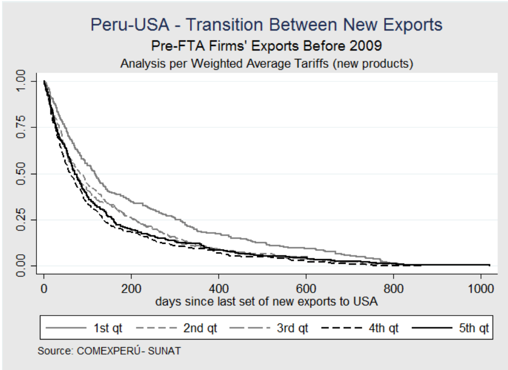
Additionally, the export behaviour by firms may vary between $pre-FTA$ and $post-FTA$ firms. Figure 5.18 compiles that analysis, across pre-FTA tariff quintiles and distinguishing between transactions done before and from 2009.

The first row confirms the findings from the previous figure, in that new products belonging to the 4th and 5th pre-FTA tariff rate quintiles tend to wait less to be introduced than products with lower trade costs. This tendency for $pre-FTA$ firms, however, is more evident for the post-FTA new exports (Figure 5.18(b)), in which nearly all tariffs become zero. Clearly, in that case new exports of the furthest quintiles are more dynamic than exports of the 2nd –the dashed grey line– and 3rd quintiles –the dashed and dotted grey line–, and even more dynamic than those of the 1st quintile –the solid grey line representing the zero MFN tariff group–. In Figure 5.18(b), the probability of introducing new products to USA becomes 50% at 123 days since the firm's last experimentation round for transactions from the 4th quintile by $pre-FTA$ firms done since 2009; while for the 5th quintile, that probability is achieved 22 days later. Relatively longer spells are taken by new exports of products with lower weighted average tariffs.

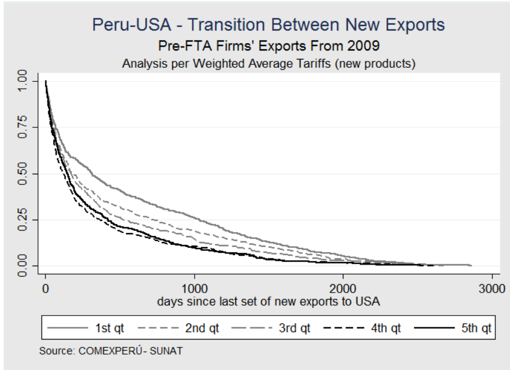
When looking at the first and second experimentation rounds, the finding described earlier also holds. Products with the highest pre-FTA tariffs tend to take less time to be exported after the FTA by more experienced firms. Particularly, the second experimentation round of products from the top quintile (Figure 5.18(h)) are by far more dynamic than the rest. Such tendency was also found for the second rounds by $post-FTA$ firms (Figure 5.18(i)). It must be pointed out though that for further rounds, the duration difference between low and high tariff products diminishes considerably. Hence, it can be argued that there is an experimentation peak for the most costly products at the second round of post-FTA transactions, followed by more experimentation with products with lower pre-FTA tariffs in further rounds. Relating these results with Equation 5.14a of my theoretical model, I highlight that for $post-FTA$ experimentation rounds by both types of firms, the gap between the top two tariff quintiles and the rest becomes larger, meaning that trade liberalisation's experimentation accelerating role is more relevant for products with highest $pre-FTA$ tariffs.

Figure 5.18: Kaplan-Meier Survival Analysis per Weighted Average Pre-FTA Tariffs (new exports)

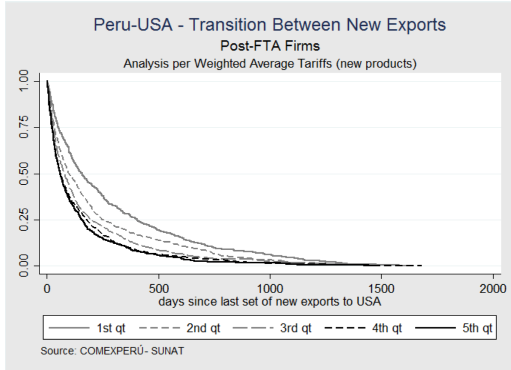
(a)



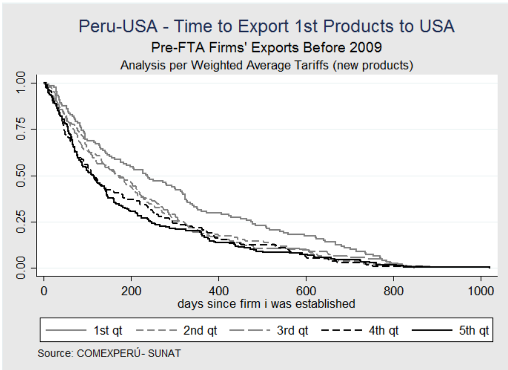
(b)



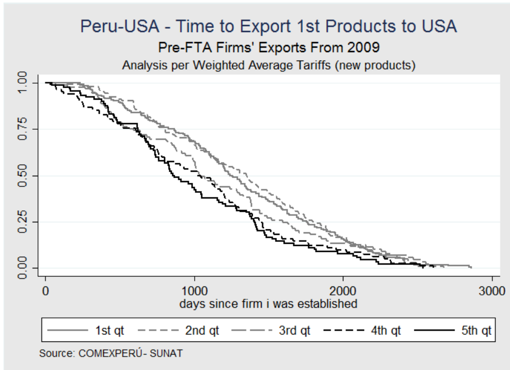
(c)



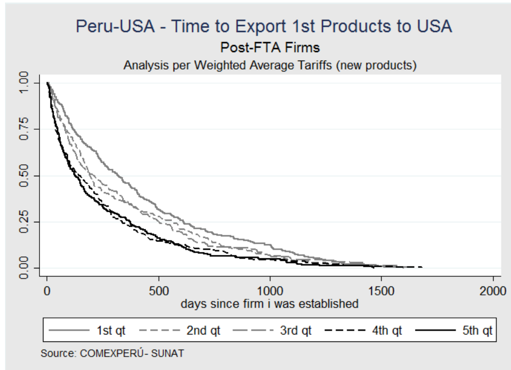
(d)



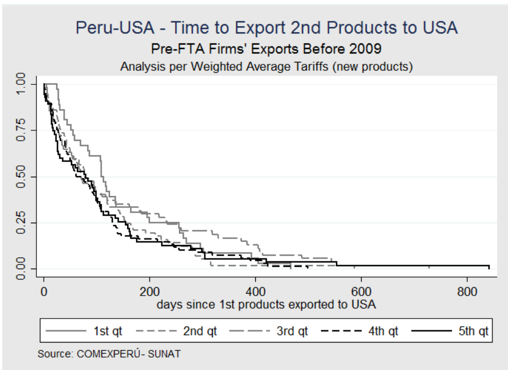
(e)



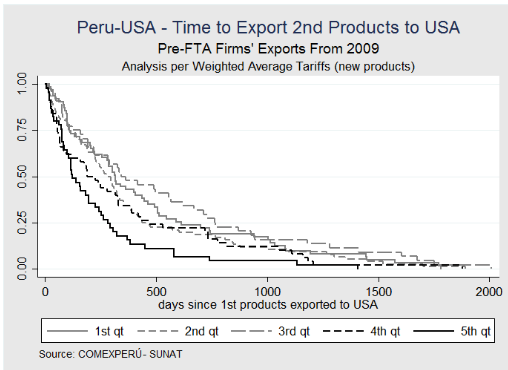
(f)



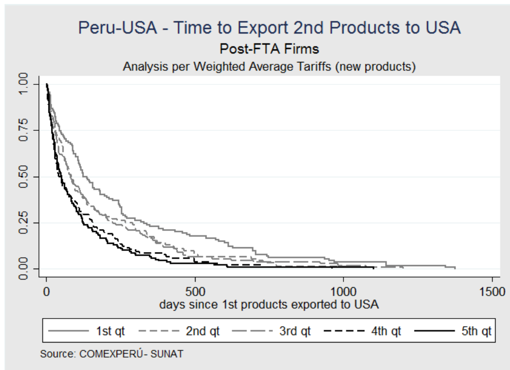
(g)



(h)



(i)



5.4.5.2 Analysis Across Trade Preference Regimes

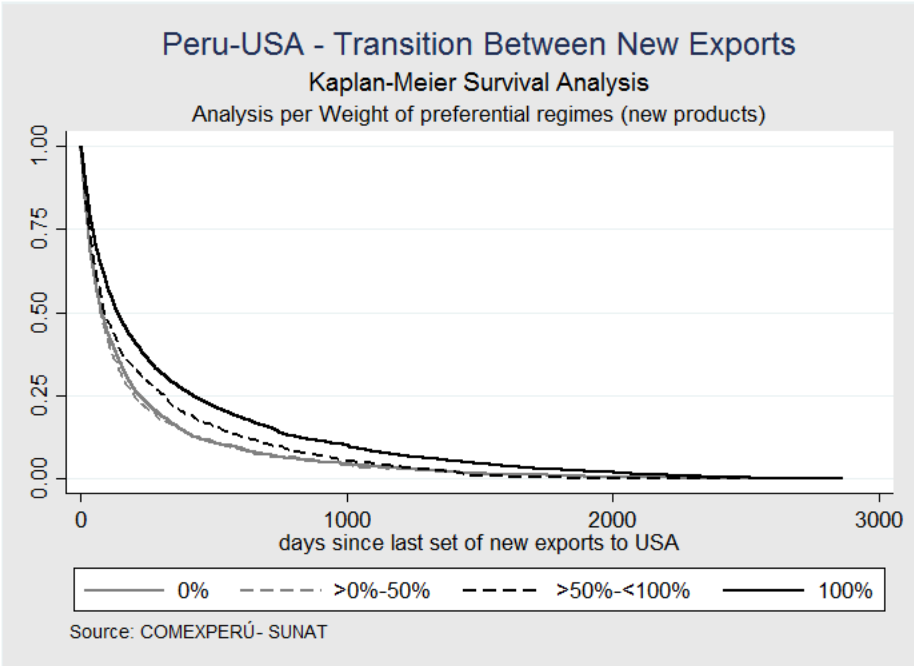
As pointed out earlier, prior to the FTA, many Peruvian products, regardless of the official USA tariff rate, enjoyed a special trade preference under the ATPDEA regime, which guaranteed a zero tariff entry into that market to several tariff lines, subject to a periodical unilateral renewal by the USA government.

In the following analysis, I construct survival functions for experimentation rounds, depending on how much of the total export value by a firm to USA on day t was accounted for by products benefited from a special trade preference, be either ATPDEA or the zero MFN tariff. I allocate experimentation rounds into four groups according to the share in the export value of new products that enjoyed a pre-FTA trade preference. The groups are as follows:

- Group 1: rounds not involving any new product with a pre-FTA trade preference (0%).
- Group 2: rounds in which up to 50% of the total value of new exports involve products with a pre-FTA trade preference (>0%-50%).
- Group 3: rounds in which over 50% but below 100% of the total value of new exports involve products with a pre-FTA trade preference (>50%-<100%).
- Group 4: rounds in which all new products enjoyed a pre-FTA trade preference (100%).

Figure 5.19 presents the outcome from this analysis, gathering all experimentation rounds from all firms in the sample. What this first graph implies is that the fastest rounds of new exports involve either no trade preference –the solid grey line– or at least a little share of products enjoying any pre-FTA zero tariff –the dashed grey line–. More days are taken for new exports from Group 3 –the dashed black line–, and even more days for new exports with full special treatment –the solid black line–.

Figure 5.19



In the last stage of this survival analysis, I present in Figure 5.20 the results distinguishing between $pre-FTA$ and $post-FTA$ experimentation rounds.

From another exercise, not reported in this paper, where I simply distinguished between $pre-FTA$ and $post-FTA$ firms, it was surprisingly obtained that, even for $pre-FTA$ firms, new exports with few or null trade preferences were quicker to occur than goods with large or full USA preference. One reason for this outcome may be that, since the USA trade preferences under ATPDEA date back to the early 1990s –formerly known as ATPA– that acceleration for liberalised products might have taken place before the start of my sample. However, one important issue to take into account in this analysis, apart from the spell length, is the number of firms/experimentation rounds per preference category.

In fact, when looking into the numbers behind Figure 5.20, in the overall results from the first row, we see that for $pre-FTA$ firms, rounds from the two extreme preference categories (0% and 100%) account for more than 80% of the total experimentation events analysed. That share is even greater for $post-FTA$ firms. Therefore, I should focus on those two extreme categories for further analyses.

Having that in mind, the results from the second row, on the first experimentation rounds, show that for $pre-FTA$ firms, both before and after the agreement, products with no trade preference tend to be sold at a faster rhythm than those fully liberalised. That gap between these two categories gets narrower for $post-FTA$ firms.

All this apparently contradicts the basics of my sequential exporting theory, which states that firms enter a market with the product with lowest trade costs. However, for $pre-FTA$ experimentation rounds, 334 (49.55%) firms begin their experience in the USA market by exporting only liberalised products; while only 221 (32.79%) sold only non-liberalised ones. As for $post-FTA$ experimentations by $pre-FTA$ firms, I obtain 276 vs. 187 firms (51.02% vs. 34.57%); and for the $post-FTA$ firms case, the difference clearly diminishes: 517 (43.23%) vs. 483 firms (40.38%). Hence, it can be seen that in general, more firms tend to experiment with a less costly product in terms of trade preferences; but since the enactment of the FTA, there is more incentive for firms to experiment with previously non-liberalised (more costly) products.

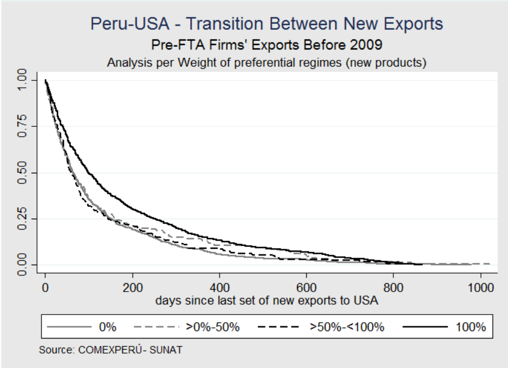
When moving further to the second round of new exports in the third row of Figure 5.20, it can be spotted that, in terms of spell length, non-pre-FTA-liberalised products get exported even more quickly, especially in $post-FTA$ experimentation rounds. In terms of number of firms, that higher frequency for experimenting with fully liberalised products observed in the first round is reversed, especially for $post-FTA$ firms. In other words, more firms tend to experiment with non-liberalised new products in the USA market at their second experimentation round. Moreover, for further rounds, the difference in favour of non-pre-FTA-liberalised products gets larger, again especially for $post-FTA$ firms.

In summary, three stylised facts can be extracted from this analysis across mean pre-FTA tariffs and trade preference regimes.

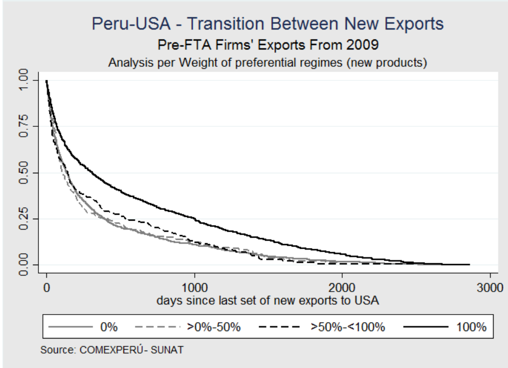
1. Products which used to enjoy no pre-FTA trade preference tend to more rapid experimentation than pre-FTA liberalised products.
2. Most firms, however, tend to start their experience in the USA market with pre-FTA liberalised products, obviously cheaper to export.
3. The USA-Peru FTA seems to encourage firms to experiment more with products that did not enjoy any prior trade preference, usually with the highest pre-FTA tariffs. The latter can be seen both in terms of experimentation speed and number of firms.

Figure 5.20: Kaplan-Meier Survival Analysis per Weight of USA Pre-FTA Preferential Regimes (new exports)

(a)



(b)



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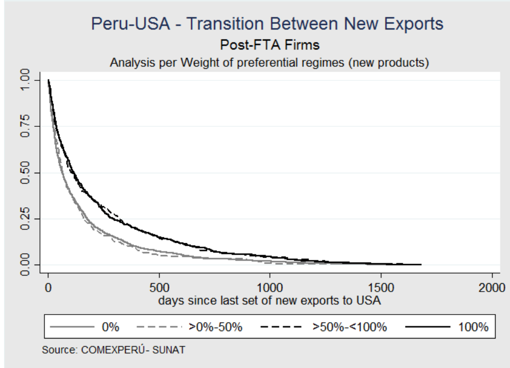
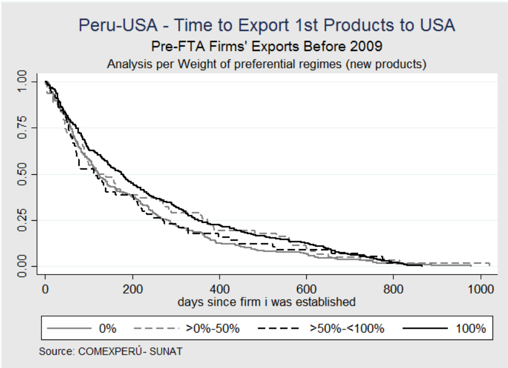
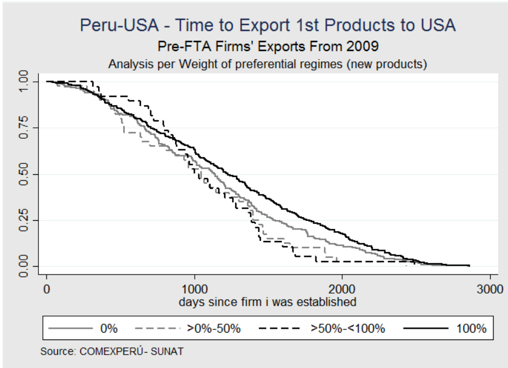


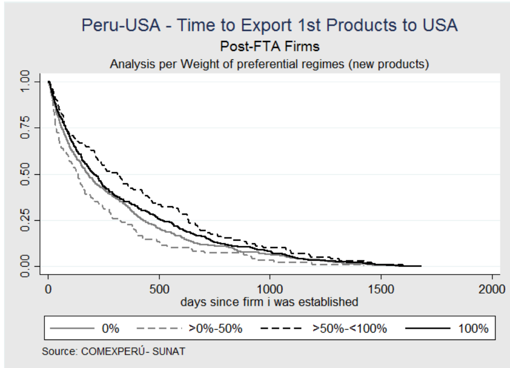
(d)



(e)



(f)



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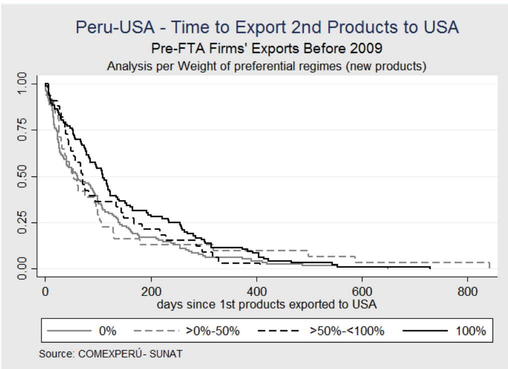
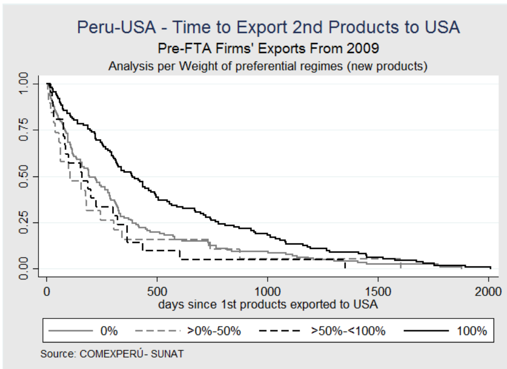
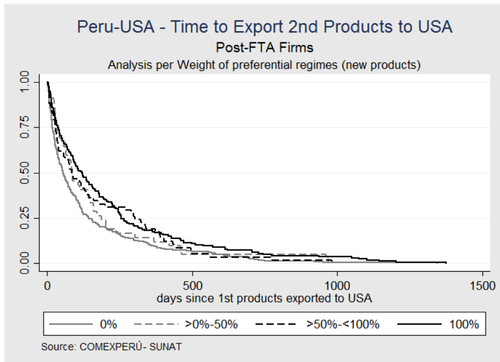


(h)



(i)



5.5 Econometric Approach

After the first testing attempt by a Kaplan-Meier survival analysis, in this section I present the main results from the econometric models, aiming to provide an alternative approach to test some of the main predictions from the theory.

5.5.1 Number of Shipments

I start by running an Ordinary Least Square (OLS) identification strategy, in which each observation represents the event of the introduction of one or many products, defined at the 8-digit level, by a Peruvian firm into the USA market, i.e. *experimentation round*. As in the previous analyses, these estimations consider Peruvian firms starting to export to USA between 2006 and 2013. Since my purpose is to assess the influence of trade liberalisation and the perceived demand for previous products on the number of shipments prior to an experimentation round, I propose the following basic specification:

$$\begin{aligned} num\_shipments\_USA_i = \alpha_0 + \alpha_1 postfta_i + \alpha_2 mean\_export\_USA_i + \\ \alpha_3 postfta * export\_USA_i + \alpha_4 new\_wmean\_tariff_i + \\ \alpha_5 postfta * tariff_i + \mu_i. \end{aligned} \tag{5.16}$$

This first approach takes every experimentation round independently, regardless of the firm, because a panel fixed effects model at the firm level, shown afterwards, omits some relevant variables I am interested in.

The dependent variable is the log of the number of shipments to USA by a Peruvian firm before experimentation round i, from experimentation round $i-1$ inclusively. That variable is regressed on $postfta$, a dummy variable taking value 1 if the firm making experimentation round i was founded between 2009 and 2013, when the USA-Peru Free Trade Agreement becomes effective. $mean\_export\_USA$ stands for the log of the firm's mean export value of shipments to USA from experimentation round $i-1$ to the last shipment before experimentation round i. These first two variables are interacted to see if there is a combined effect. Aiming to find a more specific effect of trade liberalisation at the product level, I include new_wmean_tariff, the log of one plus the average pre-FTA tariffs levied on the new products exported in experimentation round i, weighted by the export value per product. Thus, tariffs levied on products accounting for the largest shares of the full experimentation shipment are given more weight. That variable is also interacted with the $postfta$ dummy.

Further additions and modifications are made to that basic specification. Firstly, I incorporate the $pre\_postfta$ dummy, taking value 1 if experimentation round i was done by a $pre-FTA$ firm after the enactment of the FTA. By adding this dummy, and keeping the $postfta$ variable, $pre-FTA$ experimentation rounds by $pre-FTA$ firms become now the base category. $pre\_postfta$ is afterwards interacted with the export and tariff variables. Secondly, I replace the tariff regressor by new_wpref, standing for the proportion, in terms of export value, of new products exported in experimentation round i eligible for a $pre-FTA$ trade preferential regime, either ATPDEA or zero-MFN tariffs. I interact this variable with the $postfta$ and $pre\_postfta$ dummies.

This first approach and the subsequent ones all include year and sector fixed effects, as well as other controllers used in the survival analysis, such as dummies for many products per round, the elsewhere experience, and others for first and second experimentation rounds per firm. As for the sector fixed effects, they are also interacted with the mean export value variable, since the effect of the latter might be stronger for some sectors. It must be emphasised as well that, since the dependent variable is the previous number of shipments to USA, this initial estimation does not include as observations the firms' first experimentation rounds.

Table 5.13: N° Shipments by Peruvian Firms to USA Before Introduction of New Exports to That Market

Dependent Variable	num_shipments_USA							
Estimation	OLS							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
postfta	-0.271***	0.251*	-0.116***	-0.123	-0.273***	0.0616	-0.112***	-0.266
	(0.0325)	(0.132)	(0.0428)	(0.196)	(0.0325)	(0.132)	(0.0428)	(0.194)
mean_export_USA	0.0961***	0.133***	0.0923***	0.0632***	0.0950***	0.128***	0.0910***	0.0584***
	(0.0152)	(0.0166)	(0.0153)	(0.0208)	(0.0153)	(0.0166)	(0.0153)	(0.0207)
postfta*export_USA		-0.0644***		0.00915		-0.0587***		0.0144
		(0.0159)		(0.0209)		(0.0159)		(0.0209)
new_wmean_tariff		0.140		-0.158				
		(0.425)		(0.614)				
postfta*tariff		-0.975**		-0.685				
		(0.484)		(0.660)				
new_wpref					0.174***	0.0981*	0.182***	0.0912
					(0.0480)	(0.0584)	(0.0479)	(0.0836)
postfta*pref						0.190***		0.196**
						(0.0719)		(0.0924)
pre_postfta			0.232***	-0.631***			0.241***	-0.570***
			(0.0460)	(0.203)			(0.0462)	(0.200)
pre_postfta*export_USA				0.106***				0.105***
				(0.0222)				(0.0221)
pre_postfta*tariff				0.470				
				(0.734)				
pre_postfta*pref								0.00258
								(0.0994)
Sector FE / Other Regressors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
N	5036	5009	5036	5009	5028	5028	5028	5028
r2_o	0.0573	0.0919	0.0620	0.0966	0.0600	0.0945	0.0650	0.0992
F	36.63	24.19	34.58	21.70	33.62	25.12	32.10	22.55

Robust standard errors controlling for heteroskedasticity.

These estimations do not consider firms' first experimentation rounds in the USA market.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table 5.13 presents the results from this exercise. This and the next tables are divided in two sections of four specifications. The first section –Columns (1)-(4)– controls for the role of pre-FTA tariffs; whereas the last one –Columns (5)-(8)– addresses the effect of pre-FTA unilateral trade preferences. The odd columns present the results from specifications using only the main variables of interest, without interactions, as a first approach to test the main prediction of my theory. The even columns incorporate interactions of the

$postfta$ dummy to more clearly distinguish effects between $pre-FTA$ and $post-FTA$ firms. Those even columns also include year fixed effects to assess how the main covariates change with their inclusion. The last two columns of each section control for post-FTA rounds by $pre-FTA$ firms, by including the $pre\_postfta$ dummy and its interactions.

From the theory and the survival analysis, I would expect a negative coefficient for $postfta$. This is the case for the odd columns of the table, meaning that Peruvian firms founded after the enactment of the USA-Peru Free Trade Agreement tend to have fewer shipments to USA with old products before introducing new exports into that market. However, the even columns show a change in the sign when adding further covariates. That issue is discussed later.

I would also expect from the theory a negative sign for the mean export value of shipments to USA prior to an experimentation round. Instead, all specifications give a positive coefficient for $mean\_export\_USA$, i.e. a slow-down effect, which rather matches the outcome from the survival analysis. However, this might give support to Equation 5.14b of my theory, which states that the accelerating effect of mean export values of previous shipments is lower for larger means.

Something interesting occurs when controlling for the $postfta{*}export\_USA$ interaction, though. Its negative and significant coefficient in Columns (2) and (6) indicates that the slow-down effect of mean export values is lower for $post-FTA$ firms. This also implies an increasingly accelerating $postfta$ effect for higher mean exports. Focusing on Column (2), let me explore the net effects. Assuming a zero $pre-FTA$ tariff, the net effect of a 1% increase in the mean export value on the number of shipments is 0.133% for a $pre-FTA$ firm, and 0.0683% for a $post-FTA$ firm. More interestingly, taking the median value of the $mean\_export\_USA$ variable for $post-FTA$ firms (US \$ 4,077.33), the net effect of the $postfta$ dummy on the number of shipments is approximately -25%, being only US \$ 49.28 the mean export value at which the $postfta$ effect cancels out. The pattern described remains consistent across most specifications and methods I present in this chapter, and may be interpreted as follows: the effect of being a $post-FTA$ firm on experimentation speed is mostly positive, expressed in fewer shipments to USA prior to a new experimentation round compared to $pre-FTA$ firms, turning negative only for rounds preceded by very small consignments of products previously introduced. This outcome may be compared with the findings from Araujo et al. (2016), in the sense that better institutions makes exporters start with higher volumes. My results convey that trade liberalisation, as a proxy for an improvement in contract institutions, is associated with quicker experimentation with new products after starting with larger volumes of old products.

As for the weighted mean $pre-FTA$ tariff, my theory's proposition make me expect a positive coefficient; but Columns (2) and (4) do not give significant numbers. These two columns also include the interaction with $postfta$, which obtains a negative and significant value in Column (2). This sign is consistent across further estimations shown afterwards, and is reasonable to expect, as after the FTA enactment most tariffs are eliminated, facilitating the decision to experiment in USA, especially for products with higher $pre-FTA$ tariffs. Moreover, going back to the change in the sign of $postfta$ from Column (1) to (2), for instance, I can argue that the effect of being a $post-FTA$ firm on experimentation speed is an accelerating effect for most products, except for those with zero or a minimum $pre-FTA$ tariff.

But what is the effect on number of shipments for $pre-FTA$ firms experimenting after the FTA enactment? To address this concern, in Columns (3) and (4) I add the $pre\_postfta$ dummy. Column (3) shows a positive and significant coefficient for that dummy, meaning that experimentation rounds after the FTA by $pre-FTA$ firms are preceded by more shipments than rounds before the FTA by those firms. This outcome may reflect cases where, for instance, firms founded in 2006 try to experiment in 2013, long after the FTA enactment. Hence, such experimentation round may be preceded by more shipments than an equivalent event by another $pre-FTA$ firm before the agreement came into effect.

When adding the interactions in Column (4), the sign for $pre\_postfta$ becomes instead negative, with the previous positive effect being transferred to the interaction with the mean export values. Again, let me go through the net effects, assuming zero tariffs. The positive effect of a 1% increase of $mean\_export\_USA$ on the number of shipments to USA is 0.0632% for both $pre-FTA$ experimentation rounds and those done by $post-FTA$ firms; whereas it is 0.2161% for $post-FTA$ rounds by $pre-FTA$ firms. As for the effect of the $pre\_postfta$ dummy, taking the 10^{th} percentile of $mean\_export\_USA$ for $post-FTA$ rounds by $pre-FTA$ firms (US \$ 215.29), that effect is approximately -6%, and turns positive when the mean export value exceeds US\$ 384.84, which lies far below the median and average of that variable.

The described outcome can be interpreted as follows: the effect of being a $pre-FTA$ firm experimenting after the FTA enactment is mostly a slow-down effect, compared to experimenting before the agreement; but it is an accelerating one for rounds preceded by very small shipments of products already introduced, i.e. after starting small with those products. This result is consistent with the outcome from Equation 5.14a of my theoretical model, in that the effect of a tariff change on experimentation speed is lower the larger the mean value of previous shipments is. No significant effect is found for the interaction of $pre\_postfta$ with tariffs.

Columns (5)-(8) replicate the analysis, but replacing the tariff variable by the new_wpref regressor, accounting for the $pre-FTA$ unilateral trade preference share of the new exports in an experimentation round. From the Kaplan-Meier survival analysis, I would expect a positive coefficient for that variable, which actually occurs. That means, experimentations mostly embracing products with a trade preference tend to be postponed –more previous shipments of old products– longer than rounds comprising non-preference products. That effect is more evident for $post-FTA$ firms, given the positive coefficient of the $postfta * pref$ interaction, which is also an expected outcome, since products not enjoying any preferential treatment before the FTA, now can be more easily exported, leading to a lower waiting time.

Table 5.14: N° Shipments by Peruvian Firms Abroad Before Introduction of New Export to the USA Market

Dependent Variable	num_shipments_total							
Estimation	OLS							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
postfta	-0.300***	0.164	0.00574	0.0558	-0.301***	-0.0123	0.00800	-0.170
	(0.0354)	(0.165)	(0.0458)	(0.231)	(0.0354)	(0.165)	(0.0459)	(0.224)
mean_export_total	0.0962***	0.137***	0.0904***	0.0488**	0.0964***	0.134***	0.0904***	0.0462**
	(0.0167)	(0.0179)	(0.0166)	(0.0230)	(0.0168)	(0.0179)	(0.0167)	(0.0229)
postfta*export_total		-0.0682***		0.0240		-0.0645***		0.0265
		(0.0190)		(0.0242)		(0.0191)		(0.0241)
new_wmean_tariff		0.891**		1.240*				
		(0.453)		(0.666)				
postfta*tariff		-1.224**		-1.591**				
		(0.547)		(0.735)				
new_wpref					0.0264	-0.00565	0.0455	-0.0791
					(0.0514)	(0.0615)	(0.0510)	(0.0883)
postfta*pref						0.148*		0.224**
						(0.0774)		(0.0990)
pre_postfta			0.466***	-0.496**			0.472***	-0.573**
			(0.0494)	(0.239)			(0.0495)	(0.230)
pre_postfta*export_total				0.140***				0.139***
				(0.0256)				(0.0255)
pre_postfta*tariff				-0.487				
				(0.796)				
pre_postfta*pref								0.116
								(0.105)
Sector FE / Other Regressors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
N	5859	5826	5859	5826	5847	5847	5847	5847
r2_o	0.0977	0.135	0.111	0.139	0.0981	0.135	0.111	0.139
F	78.12	42.88	79.90	37.12	69.55	43.21	72.18	37.41

Robust standard errors controlling for heteroskedasticity.

These estimations consider all firms' experimentation rounds in the USA market.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table 5.14 presents a complementary exercise, now including the first experimentation rounds.[45] For that purpose, I replace the dependent variable by *num_shipments_total*, the log of the number of shipments by a firm to all destinations before experimentation round i, from round $i-1$ inclusively. It was also pertinent to employ instead the *mean_export_total*

[45] This exercise does not include first experimentation rounds not preceded by any shipment elsewhere.

regressor, the log of mean value of exports to all markets before the round of interest. Figures are fairly similar to Table 5.13; but I remark the loss of significance for the $postfta$ dummy. Conversely, there is a significance gain by the tariff variable, showing the expected positive sign in Columns (2) and (4). The $postfta * tariff$ interaction also gains significance, showing a stronger negative effect, as expected. The significance loss of the $postfta$ dummy reflects the lack of explanatory power over the total number of shipments prior to an experimentation round, given the inclusion of other controllers, such as firms' experience in other markets. In fact, the *elsewhere* dummy, not reported in this table, always shows highly significant positive coefficients, implying that focusing on other markets may prompt firms to postpone the decision to export a new product to USA, especially for the first experimentation.

Appendix C.2 shows replications of this OLS approach, considering either only the first experimentation round per firm, using the shipments to all destinations, or only the second round. For the latter, I run regressions for both types of dependent variables. On first experimentation rounds, it is striking that $postfta$ is positive in all specifications, and significant when adding the $pre\_postfta$ dummy. That may be explained by the aforementioned time difference between an experimentation round made in 2013 by a $post-FTA$ firm founded early in 2009, compared to a round produced in 2008 by a $pre-FTA$ firm founded in 2006. Additionally, the new_wpref variable on USA unilateral trade preferences always gives negative and significant coefficients, which makes sense, since firms starting their export activity in USA before 2009, tend to do it with fully liberalised products, as discussed in the survival analysis.

When it comes to analysing the second experimentation rounds, taking $num\_shipments\_USA$ as dependent variable, it is remarkable that $postfta$ keeps its negative and significant value even when controlling for $post-FTA$ rounds by $pre-FTA$ firms. This may imply that trade liberalisation exerts a trigger to grow in the USA market at the early extensive margin for $post-FTA$ firms. That effect does not seem to come from the tariff elimination, given the insignificant coefficients for the tariff variables. I did the same exercise for $num\_shipments\_total$, and no major differences from the main outcomes in Table 5.14 are found.

Appendix C.3 presents a panel data model with fixed effects at the firm level. This strategy does not allow us to distinguish the effect of being a $post-FTA$ firm *per se*, since that dummy gets omitted; but we can interact it. The mean exports to USA or all destinations keeps its positive and significant effect; but the interaction with $postfta$

loses significance in most specifications. Tariff variables are not significant, but they show consistency in the signs across columns. In fact, higher tariffs are associated with a longer delay in experimentation; but the interaction for $post-FTA$ firms is linked to an acceleration. All this gives support to the main findings presented earlier. Equal consistency is shown by the trade preference variables. Positive values, although insignificant, for new_wpref; but negative and significant coefficient for the interaction with $postfta$, implying an experimentation acceleration for $post-FTA$ firms exporting products not subject to any $pre-FTA$ preference. No relevant changes for the $pre\_postfta$ combinations, confirming the tendency for $pre-FTA$ firms to experiment quicker since the enactment of the FTA after starting small in the USA market. Although not reported, the *many* dummy, on experimentation rounds with more than one product, is consistently negative and significant, presumably providing a sign of the relaitve ease to introduce similar products in one shipment.

Overall, the results described show an apparent incompatibility between my theory's prediction and the empirical finding on the role of mean export values. That outcome leads me to think about the limitations of my approach. The observed delay in the introduction of a new product associated with larger shipments of previous goods might be due to a firm-specific decision to sufficiently enjoy the profitability in market d generated by exporting product A, which is not contemplated in my theory. Additionally, my empirical approach accounts in a preliminary way for firms' experience in other markets, by including a dummy taking value 1 if, between experimentation rounds $i-1$ and i, the firm has exported elsewhere. Clearly, further attempts can be made to account for that experience.

I am aware as well that the number of shipments of a product is not a perfect indicator of experimentation speed, since few shipments may occur within a long period of time, and the shipment frequency may also depend on the industry the product belongs to. This is to some extent tackled here by controlling for sector fixed effects of the new product introduced; but it would also be relevant to control for the industry of the old products; although most old and new products belong to the same industry.

5.5.2 Duration Model

Aiming to offer a closer complement to the earlier Kaplan-Meier survival analysis, I run a Cox Proportional Hazard Model, a continuous-time duration model proposed by Cox (1972), which estimates the hazard function for every individual from a sample, in the following general shape:

$$h(t) = h_0(t)exp(\beta_1 x_1 + \ldots + \beta_k x_k), \tag{5.17}$$

where $h(t)$ is the hazard at time t for an observation; $h_0(t)$ is the baseline hazard, not estimated in this model; and the rest of the right hand side stands for the covariates considered. The Cox Model calculates the probability of a failure to occur to an individual at time t. I opted for a continuous-time model like Cox given the nature of the time spells constructed.

As in my earlier approach, observations are at the experimentation round level; and the time spell considered is the number of days prior to the event of a firm's experimentation round i since the day of firm's round $i-1$ inclusively. Hence, the event of a Peruvian firm introducing a new export to the USA market is the "failure" in this analysis, and I measure the probability of that "failure" occurring at day t since the firm's previous "failure", or since the firm's foundation date, in case of its first experimentation round.

It is important to point out that, as many of my covariates are at the product level, this exercise does not include censored observations. And, more importantly, given the likely existence of risk heterogeneity at the firm level, I run a Cox model with shared frailty at that level.

Tables 5.15 and 5.16 report the hazard ratios ($exp(\beta_k)$) using the same regressors as the OLS analysis. Hazard ratios above unity mean that the covariate increases the probability of introducing new exports to USA; whereas ratios below unity represent a fall in that likelihood.

Table 5.15: Peruvian Firms' Probability of Introducing New Exports to USA (Hazard Ratios)

Excluding First Experimentation Rounds

Time Spell	Days After Firm i's Last Experimentation Round in USA							
Estimation	Cox Proportional Hazard Model - Shared Frailty at Firm Level							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
postfta	1.629***	1.796***	0.985	0.293***	1.626***	2.199***	0.982	0.345***
	(0.0857)	(0.329)	(0.0608)	(0.0742)	(0.0853)	(0.401)	(0.0603)	(0.0864)
mean_export_USA	0.846***	0.861***	0.849***	0.857***	0.846***	0.863***	0.849***	0.860***
	(0.0146)	(0.0160)	(0.0147)	(0.0217)	(0.0146)	(0.0161)	(0.0147)	(0.0217)
postfta*export_USA		1.022		1.026		1.019		1.021
		(0.0208)		(0.0273)		(0.0208)		(0.0271)
new_wmean_tariff	1.908**	0.649	1.784*	1.023				
	(0.582)	(0.263)	(0.546)	(0.671)				
postfta*tariff		4.327***		2.759				
		(2.272)		(2.037)				
new_wpref					0.901**	0.967	0.886**	1.032
					(0.0431)	(0.0559)	(0.0425)	(0.0919)
postfta*pref						0.851**		0.795**
						(0.0678)		(0.0833)
pre_postfta			0.477***	0.171***			0.474***	0.162***
			(0.0245)	(0.0407)			(0.0242)	(0.0380)
pre_postfta*export_USA				1.003				1.003
				(0.0249)				(0.0248)
pre_postfta*tariff				0.475				
				(0.353)				
pre_postfta*pref								0.911
								(0.0922)
FE_2009		0.283***		2.023***		0.275***		2.009***
		(0.0372)		(0.134)		(0.0356)		(0.133)
FE_2010		0.219***		1.542***		0.213***		1.548***
		(0.0290)		(0.0910)		(0.0279)		(0.0913)
FE_2011		0.169***		1.187***		0.165***		1.192***
		(0.0225)		(0.0637)		(0.0216)		(0.0638)
Sector FE / Other Regressors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
N	5025	5025	5025	5025	5044	5044	5044	5044
chi2	340.4	764.1	539.3	766.9	341.2	772.4	545.9	774.4
theta	0.350	0.282	0.339	0.282	0.349	0.283	0.338	0.283

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table 5.15 shows the results excluding the first experimentation round per firm, in order to see the effect of the mean exports to USA only. To understand the interpretation of hazard ratios, let me focus on Column (1). Being a $post-FTA$ firm increases in 62.9% a Peruvian firm's probability of introducing a new set of products to the USA market at time t, compared to a $pre-FTA$ firm. For covariates in natural logs, the interpretation is different: an e-fold rise in a firm's mean export value to USA (multiplied by $e=2.718$) since its last experimentation round reduces the new experimentation likelihood by 15% approximately; and an e-fold rise in the $pre-FTA$ tariff on products raises the experimentation probability by about 91%.

As in the OLS approach, the $postfta$ dummy changes sign when including the $pre\_postfta$ regressors; and the mean export value keeps its hazard-reducing function across all specifications. Regarding the tariff variable, when including its interaction with $postfta$, it loses significance and even gets its role reversed; while the interaction turns out to be highly significant, with a clear role of increasing the experimentation probability in Column (2), meaning that $post-FTA$ firms tend to experiment faster in the USA market with goods previously charged with high tariffs. The figures for the new_wpref variables are consistent with the outcome from the previous analyses: firms tend to experiment earlier in the USA market with products with no $pre-FTA$ unilateral trade preference by USA, especially in the case of firms founded after 2009.

An important difference with respect to the OLS estimates occurs with the variables accounting for $post-FTA$ experimentation rounds by $pre-FTA$ firms. The significant coefficients below unity for $pre\_postfta$ in all specifications imply that this category of experimentation tends to take more days to occur than experimentation rounds made before the FTA enactment, which makes sense given the time comparisons mentioned earlier between pre and $post-FTA$ experimentation rounds by $pre-FTA$ firms. However, interactions, especially that with the mean export value, are all insignificant. This differs from the previous analysis, where $pre\_postfta$ experimentation rounds preceded by small shipments tended to occur faster.

Apparently, the inclusion of the $pre\_postfta$ covariates discards any accelerating effect of trade liberalisation. Nevertheless, Columns (4) and (8) control for year fixed effects, which hazard ratios are worth referring to. While 2007 and 2008 dummies –not reported in this chapter– have a slow-down effect on experimentation, that effect dramatically reverses into acceleration for 2009, the year of the FTA enactment. In fact, the experimentation probability increases by more than 100% in that year with respect to 2006, the base year. In other words, a Peruvian firm in 2009 is over 100% more likely to experiment in USA t days after its last experimentation round than a firm in 2006. That effect decreases to around 54% for 2010 and 19% for 2011. Hence, these results confirm that there is an effect from trade liberalisation in favour of faster export experimentation by Peruvian firms in the USA market.[46]

Table 5.16 incorporates the first experimentation rounds into the sample to measure the effect of mean export values to all destinations. No major changes to the results in Table 5.15 occur. Perhaps, I may highlight that in the first four columns the accelerating role of the $postfta$ variables is stronger, since the interaction with export values recovers its significance, as in the OLS approach; and the interaction with tariffs provides a more evident effect in favour of experimentation. That means, $postfta$ firms experiment faster with products with higher $pre-FTA$ tariffs after having shipped large export values abroad.

Very similar results are obtained for Cox estimations without shared frailty, with standard errors clustered at the firm level, presented in Appendix C.4. I also present in Appendix C.5 separate Cox estimations for first and second experimentation rounds. The results do not differ from the shared frailty exercise nor the OLS estimations; but I can remark that the aforementioned acceleration effects arising from the year fixed effects after the FTA enactment get dramatically inflated for these first two experimentation rounds, especially the first one. The 2009 dummy provides a 2,000% jump in the probability to send a first shipment to USA; while a 660% and 350% probability rise are given by the 2010 and 2011 dummies, respectively.

[46]The estimations from the Cox Proportional Hazard approach control for year fixed effects from 2007 to 2013; but only coefficients for 2009-2011 dummies are reported in this chapter.

Table 5.16: Peruvian Firms' Probability of Introducing New Exports to USA (Hazard Ratios)

Including First Experimentation Rounds

Time Spell	Days After Firm i's Last Experimentation Round in USA or Entry into Business (1st Round)							
Estimation	Cox Proportional Hazard Model - Shared Frailty at Firm Level							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
postfta	1.710***	1.576**	1.090	0.211***	1.524***	1.808***	1.141**	0.288***
	(0.0849)	(0.297)	(0.0615)	(0.0529)	(0.0867)	(0.373)	(0.0736)	(0.0780)
mean_export_total	0.820***	0.856***	0.823***	0.865***	0.802***	0.838***	0.805***	0.835***
	(0.0143)	(0.0155)	(0.0143)	(0.0210)	(0.0151)	(0.0168)	(0.0151)	(0.0228)
postfta*export_total		1.052**		1.035		1.043*		1.047
		(0.0216)		(0.0270)		(0.0238)		(0.0305)
new_wmean_tariff	1.396	0.658	1.230	0.628				
	(0.415)	(0.249)	(0.367)	(0.377)				
postfta*tariff		5.255***		5.309**				
		(2.533)		(3.575)				
new_wpref					0.893**	0.964	0.886**	1.045
					(0.0433)	(0.0556)	(0.0430)	(0.0927)
postfta*pref						0.841**		0.773**
						(0.0670)		(0.0808)
pre_postfta			0.501***	0.157***			0.641***	0.166***
			(0.0238)	(0.0371)			(0.0325)	(0.0417)
pre_postfta*export_total				0.973				1.004
				(0.0238)				(0.0272)
pre_postfta*tariff				0.883				
				(0.601)				
pre_postfta*pref								0.890
								(0.0899)
FE_2009		0.225***		2.577***		0.276***		1.986***
		(0.0263)		(0.162)		(0.0358)		(0.132)
FE_2010		0.159***		1.810***		0.218***		1.556***
		(0.0189)		(0.100)		(0.0286)		(0.0917)
FE_2011		0.120***		1.337***		0.168***		1.193***
		(0.0143)		(0.0677)		(0.0221)		(0.0639)
Sector FE / Other Regressors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
N	5832	5832	5832	5832	5853	5853	5853	5853
chi2	498.6	1808.4	708.7	1786.1	595.2	795.0	673.9	797.3
theta	0.473	0.245	0.438	0.263	0.665	0.287	0.642	0.287

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

5.6 Conclusions

Previous research has found that firms surviving in the export activity tend to experiment sequentially, but no study has so far investigated what is the speed of that experimentation and what factors determine that speed. This chapter bridges that gap by investigating the strategy firms undertake to penetrate into one particular destination, by exporting new products sequentially. More precisely, I am interested in how quickly firms experiment with a new product in that market, after having done so with other previous products.

For that purpose, I develop a theoretical model where product demands follow a joint bivariate distribution, imperfectly correlated. By sending shipments of the cheaper product A to market d, thereby realising the demand for A, a firm gradually updates its expected demand for the more costly product B. Thus, the expected demand for B is in function of the number of shipments of A, as well as the demand correlation of both products, and the mean value of those shipments.

As a result, my model predicts that *experimentation speed* in a sequential exporting strategy is greater (i.e. fewer shipments of A before introduction of B) with (i) lower trade costs of product B; (ii) larger mean export values of A to market d; and (iii) higher correlation between the two products' demand in d. The magnitude of these effects clearly depend on the initial values of those variables.

This prediction is empirically tested with a survival analysis, comprising a Kaplan-Meier survival estimation and a Cox proportional hazard model, along with an OLS and panel data approach, using a very rich dataset of Peruvian exports to the USA market, covering the 2006-2013 period. The data was processed to obtain a set of observations, each representing the event in which a Peruvian firm introduces one or more new products to the USA market, known in this paper as an *experimentation round*. I give special emphasis on the role of trade liberalisation, expressed as the tariff elimination by the United States on Peruvian products, under the Free Trade Agreement signed by both countries in 2009. Thus, this paper is one of the first attempts to measure the effects of this FTA on Peruvian exporters' experimentation in the USA market.

Overall, the prediction from my theoretical approach finds empirical support regarding the effect of trade liberalisation on *experimentation speed*. This can be observed in several ways. Firstly, $post-FTA$ firms, founded between 2009 and 2013, tend to introduce new products to USA faster than $pre-FTA$ firms, expressed in either fewer previous shipments of other products to that market or fewer days since the introduction of the previous product. Secondly, that process is even quicker if the product used to face a high tariff prior to the FTA enactment and/or was not subject to a $pre-FTA$ unilateral trade preference regime by USA, such as ATPDEA or MFN zero tariff. Thirdly, the probability of a firm experimenting in USA (the hazard ratio) dramatically jumps if the round takes place in 2009, the year of the FTA enactment, and in 2010, to a lesser extent.

The effect of the mean export value of old products on experimentation speed appears to be opposite to my theory's prediction. Indeed, higher mean shipments of product A are associated with a delay in the introduction of product B, expressed in more prior shipments of A or more days since the first shipment of A. This outcome may be related with the dynamics of my prediction, in that the negative association between mean export values of A and the number of prior shipments is smaller for larger mean exports. Moreover, when linking this factor with trade liberalisation, I find interesting results. $Post-FTA$ firms, compared to $pre-FTA$ firms, are boosted to experiment faster in the USA market after shipping larger values of old products. However, since 2009, $pre-FTA$ firms are prompted to experiment faster with a new product after shipping lower amounts of other products (i.e. after starting small with them).

There are clearly several issues to be addressed in the future. The role of correlation between the products demand in the market of interest is yet to be tested empirically. Hence, for further research I may control for that by, for instance, including a variable controlling for the degree of similarity between products A and B; although that aim gets more complicated for further experimentation rounds, and if those rounds comprise more than one product. Moreover, it can be argued that firms' better performing products –core competencies– tend to be exported more rapidly and earlier than worse performing ones. In terms of the theoretical approach, I may allow in further studies the entry costs per product to vary with firms' export experience in the market of interest and assess how this affects firms's decision to introduce a new product to that destination. Besides, this chapter is focused on the act of introducing a product into a market, without addressing the actual volume of that introduction. That is also a pertinent issue for further research.

Finally, more data availability on firm-specific characteristics to account for heterogeneity, as well as product-specific information on costs, or information on the buyer side, are other important inputs to better investigate these export dynamics. To my knowledge, this is the first attempt to analyse the determinants of experimentation speed across products in a market, and surely future researches may arise for other contexts.

6 Conclusions

The research in this thesis addresses the dynamics undergone by firms in one particular export market, introducing new products into that destination sequentially, and the determinants of these dynamics. The thesis places emphasis on the role of trade liberalisation and differences across products in terms of production efficiency. It also gives special consideration to firms' experience in the market of interest. All this analysis is implemented in the context of Peruvian firms in the USA market.

This thesis bridges several gaps in the literature on firm export dynamics. Despite the fact that recent studies have addressed the firm entry and exit dynamics in export participation, as well as across destinations, little has been written on how firms evolve in the exploration of one particular destination, and factors such as trade liberalisation have not been sufficiently regarded. Moreover, the case of Peru-USA trade relations is an interesting one, since the enactment of the Free Trade Agreement in 2009 by both countries is a recent event, not so analysed yet, from which various research questions can be addressed. The availability of a unique dataset of export transactions by Peruvian firms on a daily basis allows me to make as a detailed analysis as possible across products in Peru's main trading partner, which is the United States.

This research has explored, both theoretically and empirically, the decisions made by a firm on entering, experimenting and exiting from a particular destination, and the main determinants of those decisions.

The strategy followed in Chapters 3 and 4 was to implement a two-period analysis, whereby I evaluated firms' decisions of introducing a into a destination, assessing their performance with that product in that market, and stopping their business with that good in such destination.

I illustrated these decisions theoretically in Chapter 3. A firm from country o producing two products A and B evaluates whether to enter or not into destination d in $t = 1$ and $t = 2$. I explore an initial scenario, with no trade liberalisation, in which it is cheaper to export A, but it is cheaper to produce B, i.e. product B is the core competence. My main assumption is that export profitabilities in market d is perfectly correlated over time and across products, but initially uncertain. Thus, a firm can only realise the profitability in the market of interest by introducing a product into that country.

As a result, by *ex ante* maximising gross and net profits at both periods, the firm can opt for an entry strategy and how much from each product to export to d in each period. Three entry strategies are possible: (1) *no entry*, whereby the market export profitability is not realised; (2) *simultaneous entry*, with both products A and B sold in $t = 1$; and (3) *sequential entry*, exporting the cheapest product A in $t = 1$, and selling both goods in $t = 2$.

From that framework, three predictions arise on the export dynamics undergone by firms, distinguishing between the performances of new exporters (one-year experience in a destination) and more experienced firms in the market of interest, considering the role of trade liberalisation –expressed as an unanticipated tariff elimination by country d in $t = 2$– and the difference between "non-core" and "core competence" products.

Overall, new exporters, conditional on survival, tend to grow faster in both the intensive margin (export growth of one product) and extensive margin (introduction of a new product) in the market of interest than more consolidated exporters. The rational behind this outcome is that, when a firm enters into a market for the first time, it realises the export profitability of that market, and is tempted to explore that market even more, by increasing its sales of a product and/or selling other products there; whereas the expert firm might have already made that exploration in the past. Nevertheless, new exporters are also more likely to stop exporting a product to d in $t = 2$ than the experts. Trade liberalisation represents a boost for the intensive margin growth and to reduce the exit probability of new exporters. It also contributes to raise the likelihood to introduce a new product, but this boost is larger for the experts. That entry likelihood is greater for "core competence" products; whereas the intensive margin growth and exit probability are larger for "non-core" products.

The predictions from that theoretical model were tested empirically in Chapter 4, using the aforementioned wide dataset of Peruvian export transactions to the USA market, covering the 2006-2013 period, collapsing the original data to an annual basis. I propose one identification strategy per prediction, running a panel data model with firm fixed effects for the intensive margin, and linear probability models for the extensive margin and exit probability.

Most of the features predicted by my theory in Chapter 3 are empirically supported. Peruvian firms with only one-year experience in the USA market are more likely than more consolidated firms to grow faster at the intensive and extensive margin, across products, from one year to the other. However, those newcomers are also more likely than the experts to stop exporting a good to USA one year later. Trade liberalisation is accounted for by the change in the tariff levied by USA on a Peruvian product between $t-1$ and t (most tariffs are eliminated in 2009). That factor does not significantly affect firms' decisions in the intensive margin; but it contributes to increase the likelihood of introducing a new product to USA, especially for the expert firms. That event also helps to reduce the probability of stopping the sales of a product in USA, being this effect more important for the newest exporters. The larger intensive margin growth found for new exporters is even greater for "non-core" products; whereas the increase of the entry likelihood and exit prevention for new firms are more evident for "core competence" products. These dynamics of "core" products are more pronounced for the smallest firms. Finally, the described extensive margin probability tends to be larger if the product introduced is similar to those exported earlier to USA.

In Chapter 5, I went deeper into the sequential exporting strategy, and explore how quickly firms experiment with a product in a particular market, after having done so with other previous products there, and the determinants of that speed. This undertakes a very innovative approach, with little previous literature done on trade.

I develop a theoretical model with two products, the demands for which follow a joint bivariate distribution, imperfectly correlated. By sending shipments of the cheapest product A to market d, thereby realising the demand of A, the firm gradually updates its expected demand of the more costly product B. Thus, the expected demand of B is a function of the number of shipments of A, the correlation of the two demands and the mean value of those shipments. One prediction is derived from this scheme, stating that *experimentation speed* in a sequential exporting strategy is greater (i.e. fewer shipments of A before introduction of B) with (i) lower trade costs of B; (ii) larger mean export values of A to d; and (iii) larger correlation between both products' demands in d. The magnitude of these effects depends on the initial values of those variables.

This prediction was empirically tested with a survival analysis, consisting of a Kaplan-Meier survival estimation and a Cox proportional hazard model, along with OLS and panel data approaches. I exploit the daily transaction-level of my data of Peruvian exports to USA, constructing an innovative dataset, in which each observation represents the event in which a Peruvian firm introduces a new product into the USA market, known as an *experimentation round*. Like in Chapter 4, I cover the 2006-2013 period and give emphasis to the role of trade liberalisation, consolidated by the enactment of the USA-Peru Free Trade Agreement in 2009.

From those empirical exercises, I obtain that trade liberalisation effectively encourages experimentation, by accelerating firms' Peruvian firms' decision to introduce a new product into the USA market. Indeed, the predicted effect of trade liberalisation finds support in my empirical approach in several ways. (1) $Post-FTA$ firms, founded between 2009 and 2013, tend to introduce new products faster in USA than $pre-FTA$ firms, expressed as either fewer shipments of other products to that market, or fewer days since the introduction of the previous product. (2) Experimentation is even quicker when the product used to be levied a high tariff before the FTA and/or was not subject to any pre-FTA unilateral trade preference regime by USA (ATPDEA or MFN zero tariff). (3) The probability of a firm experimenting in USA (hazard ratio) dramatically jumps in 2009, the year of the FTA enactment, and 2010, to a minor extent.

As for the effect of the mean export value of old products on experimentation speed, higher mean shipments of product A is associated with a delay in the introduction of product B, apparently contradicting my theoretical prediction. However, this outcome may be related to the dynamics of my prediction, in that the accelerating effect of mean export values of A is smaller for larger mean export values. Moreover, when linking this factor with trade liberalisation, I find that $post-FTA$ firms are boosted to experiment faster in the USA market after shipping larger values of old products. On the contrary, since the FTA enactment, $pre-FTA$ firms tend to experiment faster with a new product after smaller shipments of other products, i.e. after starting small with them.

In conclusion, my thesis shows that there is a huge potential for evolution within an export market by firms that are in the initial stage of their experimentation process, despite their tendency to stop their business with a particular product in that destination. Moreover, trade liberalisation, although it may have a little effect on prices, acts as a factor encouraging experimentation, providing more security to novel firms, prompting them to remain selling a good in the market, as well as an accelerating motor in the decision to introduce new products into that destination.

However, there remains plenty of scope for further research to be done on experimentation in an export market, despite the fact I cover several strands in my thesis. In Chapter 3, for instance, I do not contemplate the experience a firm might have had in any other destination. Besides, trade liberalisation was taken as an unanticipated shock. Hence, further research could extend this model by considering the firm's possibility of exporting a good into a third market prior to the market of interest, as well as allowing firms to anticipate a trade liberalisation process, and see how this affects their export decisions.

Anticipation of tariff elimination may also enrich the empirical results of Chapter 4, where the analysis was limited by the lack of data, such as firm-specific characteristics to account for firm heterogeneity or product-specific information, such as production costs. Information from the buyer side may also be useful to better illustrate firms' entry and exit decisions in the USA market. Furthermore, I have been relying on the "one-year experience" criterion to label an exporter as "new". Surely, that criterion can be reformulated and see how the results change by taking as "new" firms with two or three years, or even six months, of experience. My data availability also allows me to think of a further step, which is how likely are firms to experiment with a product in another destination, right after having an experience in the USA.

Finally, in Chapter 5 the role of demand correlation across products in the market of interest is yet to be tested empirically. One way to deal with that is by controlling for product similarity between experimentation rounds, although this objective gets more complicated with rounds comprising more than one product. It may also be argued that better performing products –"core competence"– tend to be exported more rapidly and earlier than worse performing ones. That is another issue to address in the future. The trade relation between Peru and the United States is a scenario in which plenty of further research questions can be addressed.

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A Appendix to Chapter 3

A.1 Proof of the Model Predictions

A.1.1 Prediction 1: Intensive Margin

A.1.1.1 Without Trade Liberalisation

In a scenario without trade liberalisation, firms choose their optimal export values of their first product A to destination d in t=1,2 as follows:

1. At t=1, $q_1^A = 1_{\{E\mu^N > \tau^A + c_p^A\}} \left(\frac{E\mu^N - \tau^A - c_p^A}{2} \right) + 1_{\{E\mu^N \leq \tau^A + c_p^A\}} \varepsilon$.
2. At t=2, if $\mu^N > \tau^A + c_p^A$, $q_2^A = \frac{\mu^N - \tau^A - c_p^A}{2}$.

For $t = 2$, I can make an ex ante calculation of the expected value of q_2^A, conditional on survival; namely, if the discovered export profitability is greater than the known costs ($\mu^N > \tau^A + c_p^A$):

$$
\begin{aligned}
\text{Ex ante } E(q_2^A \mid \mu^N > \tau^A + c_p^A) &= \int_{\tau^A + c_p^A}^{\overline{\mu^N}} \frac{\mu^N - \tau^A - c_p^A}{2} \mathrm{d}G(\mu^N \mid \mu^N > \tau^A + c_p^A) \\
&= \frac{\int_{\tau^A + c_p^A}^{\overline{\mu^N}} \frac{\mu^N - \tau^A - c_p^A}{2} \mathrm{d}G(\mu^N)}{1 - G(\tau^A + c_p^A)} \\
&= \frac{E(\mu^N \mid \mu^N > \tau^A + c_p^A) - \tau^A - c_p^A}{2} > 0.
\end{aligned}
\tag{A.1}
$$

Using this ex ante value for q_2^A, I am now able to calculate the firm's export growth of product A to d, denoted as δ^A, depending on its initial expectations:

$$
\text{If } E\mu^N \leq \tau^A + c_p^A,\ \delta^A \equiv \frac{E(\mu^N \mid \mu^N > \tau^A + c_p^A) - \tau^A - c_p^A}{2} - \varepsilon > 0. \tag{A.2}
$$

$$
\begin{aligned}
\text{If } E\mu^N > \tau^A + c_p^A,\ \delta^A &= \frac{E(\mu^N \mid \mu^N > \tau^A + c_p^A) - \tau^A - c_p^A}{2} - \frac{E\mu^N - \tau^A - c_p^A}{2} \\
&= \frac{1}{2}[E(\mu^N \mid \mu^N > \tau^A + c_p^A) - E\mu^N] > 0.
\end{aligned}
\tag{A.3}
$$

Hence, regardless of the initial expectations by the firm on the export profitability, it will experience a positive export growth at the intensive margin in $t = 2$, conditional on having survived in $t = 1$. In order to clarify the outcome in Equation A.3, I can prove that the last term in squared brackets is positive. $E(\mu^N \mid \mu^N > \tau^A + c_p^A)$ can be expressed as:

$$
\begin{aligned}
E(\mu^N \mid \mu^N > \tau^A + c_p^A) &= \int_{\tau^A + c_p^A}^{\overline{\mu^N}} \mu^N \mathrm{d}G(\mu^N \mid \mu^N > \tau^A + c_p^A) \\
&= \int_{\tau^A + c_p^A}^{\overline{\mu^N}} \frac{\mu^N}{1 - G(\tau^A + c_p^A)} \mathrm{d}G(\mu^N) \\
&= \frac{1}{1 - G(\tau^A + c_p^A)} \{\overline{\mu^N} - \int_{\tau^A + c_p^A}^{\overline{\mu^N}} G(\mu^N)\mathrm{d}\mu^N\}.
\end{aligned} \tag{A.4}
$$

The last term in curly brackets was obtained through integration by parts. Considering that $E\mu^N = \overline{\mu^N} - \int_{\underline{\mu^N}}^{\tau^A + c_p^A} G(\mu^N)\mathrm{d}\mu^N - \int_{\tau^A + c_p^A}^{\overline{\mu^N}} G(\mu^N)\mathrm{d}\mu^N$, I can rewrite Equation A.4 as:

$$
E(\mu^N \mid \mu^N > \tau^A + c_p^A) = \frac{1}{1 - G(\tau^A + c_p^A)} \{E\mu^N + \int_{\underline{\mu^N}}^{\tau^A + c_p^A} G(\mu^N)\mathrm{d}\mu^N\}. \tag{A.5}
$$

This result, along with the fact that $G(\tau^A + c_p^A) > 0$ if $\tau^A + c^{pA} \in (\underline{\mu^N}, \overline{\mu^N})$ –making $\frac{1}{1-G(\tau^A + c_p^A)} > 1$–, proves that $E(\mu^N \mid \mu^N > \tau^A + c_p^A) > E(\mu^N)$ and, hence, the export growth δ^A for new exporters in destination d, conditional on survival, is positive.

For the next periods, no export growth is expected for product A, $\delta^A = 0$, since the further export values also depend on the already realised export profitability, which exceeds the known trade and production costs. In other words, for all $t > 1$, $E(q_t^A \mid \mu^N > \tau^A + c_p^A) = \frac{E(\mu^N \mid \mu^N > \tau^A + c_p^A) - \tau^A - c_p^A}{2}$.

As for the rest of products $j \neq A$, recall that the firm starts exporting that product to d in period t only if $\mu^N > 2F_d^{1/2} + \tau^j + c_p^j$. Since the uncertain export profitabilities are correlated over time and output decisions are based on them once realised, I do not expect any positive export growth for product j from t to $t + 1$. Therefore, I expect the export values for product j to d to be the same over time:

$$
E(q_{t+1}^j) = E(q_t^j) = \frac{E(\mu^N \mid \mu^N > 2F_d^{1/2} + \tau^j + c_p^j) - \tau^j - c_p^j}{2}, \forall t > 1, \tag{A.6}
$$

which means that I also expect δ^j to be zero for products other than A. Hence, overall I expect a higher export growth for firm's first product sold in d, product A, between $t = 1$ and $t = 2$.

A.1.1.2 With Trade Liberalisation at t=2

Without trade liberalisation, it is cheaper to export product A to d ($\tau^A + c_p^A \leq \tau^B + c_p^B$). But if we assume that trade liberalisation, expressed as a tariff elimination, occurs in $t = 2$, it will be less costly to export product B since then, as $c_p^A > c_p^B$. This will have an effect on the firm's output decision from $t = 2$ onwards.

If the firm opts for a *sequential entry* strategy, it will experiment with product A in $t = 1$, because at that period it is still more efficient producing A. Hence, the calculation of q_1^A will be identical to the case of no liberalisation, with the small value ε for pessimistic expectations. However, at $t = 2$, when τ^A is eliminated, the firm will only consider the existing production cost c_p^A in its export decisions. Hence, at $t = 2$, if $\mu^N > c_p^A, q_2^A = \frac{\mu^N - c_p^A}{2}$.

When taking the ex ante expected value of q_2^A, now the "conditional on survival" constraint is limited to $\mu^N > c_p^A$, leading to:

$$\begin{aligned}
\text{Ex ante } E(q_2^A \mid \mu^N > c_p^A) &= \int_{c_p^A}^{\overline{\mu^N}} \frac{\mu^N - c_p^A}{2} \mathrm{d}G(\mu^N \mid \mu^N > c_p^A) \\
&= \frac{\int_{c_p^A}^{\overline{\mu^N}} \frac{\mu^N - c_p^A}{2} \mathrm{d}G(\mu^N)}{1 - G(c_p^A)} \\
&= \frac{E(\mu^N \mid \mu^N > c_p^A) - c_p^A}{2} > 0.
\end{aligned} \tag{A.7}$$

After this calculation above, I can again obtain the export growth δ^A, depending on the firm's initial expectations:

$$\text{If } E\mu^N \leq \tau^A + c_p^A,\ \delta^A \equiv \frac{E(\mu^N \mid \mu^N > c_p^A) - c_p^A}{2} - \varepsilon > 0. \tag{A.8}$$

$$\begin{aligned}
\text{If } E\mu^N > \tau^A + c_p^A,\ \delta^A &= \frac{E(\mu^N \mid \mu^N > c_p^A) - c_p^A}{2} - \frac{E\mu^N - \tau^A - c_p^A}{2} \\
&= \frac{1}{2}[E(\mu^N \mid \mu^N > c_p^A) + \tau^A - E\mu^N] > 0.
\end{aligned} \tag{A.9}$$

Working on the last term in squared brackets in Equation A.9, as I did in the case of no liberalisation, I can conclude that δ^A when $E\mu^N > \tau^A + c_p^A$ is positive and greater than the export growth rate without the tariff elimination. This can be seen if I operate that term in squared brackets and obtain the following expression:

$$\text{If } E\mu^N > \tau^A + c_p^A,\, \delta^A = \frac{1}{2}\Big[\frac{1}{1-G(c_p^A)}\{E\mu^N + \int_{\underline{\mu^N}}^{c_p^A} G(\mu^N)\mathrm{d}\mu^N\} + \tau^A - E\mu^N\Big], \quad \text{(A.10)}$$

which will be greater the larger the initial tariff and production costs are. This outcome means that the firm just entering destination d in $t = 1$, in spite of tending to experiment with cheaper products, will experience a greater export growth at $t = 2$ with products that are more costly to produce (non-core competence products) and/or initially more expensive to export.

If the firm decides to apply a *simultaneous entry* strategy in a context of trade liberalisation, it will also export product B in $t = 1$ because it expects that $E\mu^N > \tau^B + c_p^B$. Hence, in that case, the definition of its optimal export values in both periods and the correspondent export growth will be identical to what was done for product A at the *sequential entry* strategy. Thus, the outcomes from Equations A.7 and A.10 can be generalised to every product j with which the firm enters destination d simultaneously.

As for an expert firm, which was exporting to d before $t = 1$, there is also an effect on its intensive margin from trade liberalisation. Since it has already discovered its export profitability in that market, its export growth for product j from $t = 1$ to $t = 2$ will be expressed as:

$$\delta^j \text{ for an expert firm } = \frac{\mu^N - c_p^j}{2} - \frac{\mu^N - \tau^j - c_p^j}{2} = \frac{\tau^j}{2}. \quad \text{(A.11)}$$

This means that, while new firms in market d obtain their intensive margin growth based on their initial expectations and the trade and production costs, for expert firms that export growth will only be determined by the eliminated tariff, which makes sense since both μ^N and c_p^j are already known to them. Comparing Equations A.10 and A.11, I can argue that the export growth for new firms is greater than for the incumbent; namely, trade liberalisation has a greater positive effect at the intensive margin for the newcomers.

Once the tariff elimination took place, for all $t > 2$, new firms will define their export values basing only on their expected μ^N and the production costs. Since in that scenario, $c_p^B < c_p^A$, they will begin experimenting with the less costly product B instead. Again, the export growth for new exporters one period later will be greater than the zero growth for the incumbents; and no positive export growth is expected for other products these newcomers might export in the future. Even though new firms tend to start experimenting with the cheapest products, their initial export growth will be greater the more costly those products are, since after trade liberalisation, the export growth δ^j in the optimistic scenario is expressed as follows:

$$\begin{aligned} \text{If } E\mu^N > c_p^j,\ \delta^j &= \frac{1}{2}[E(\mu^N \mid \mu^N > c_p^j) - E\mu^N] \\ &= \frac{1}{2}[\frac{1}{1-G(c_p^j)}\{E\mu^N + \int_{\underline{\mu^N}}^{c_p^j} G(\mu^N)\mathrm{d}\mu^N\} - E\mu^N]. \end{aligned} \tag{A.12}$$

A.1.2 Prediction 2: Extensive Margin

A.1.2.1 Without Trade Liberalisation

Let me denote as $Pr(e_2^j = 1 \mid e_1^A = 1\&e_1^j = 0)$ the probability that a firm which has just started to export to destination d in $t = 1$ with the cheapest product A will export product j in the next period. Likewise, let me denote as $Pr(e_t^j = 1 \mid \pi_{i=1}^{t-1} e_{t-i}^A = 1\&e_{t-1}^j = 0)$ the probability that a firm which has been exporting the cheap product A to destination d for longer will start to export product j to d in $t \geq 2$.

Since the new surviving firm has just discovered the export profitability μ^N by exporting A to market d, it will export any product j in the next period if $\mu^N \geq 2F_d^{1/2} + \tau^j + c_p^j$; namely, if its maximised profits from exporting j are greater than j's sunk entry costs. And, if μ^N follows a cumulative distribution function $G(.)$, I can argue that $Pr(e_2^j = 1 \mid e_1^A = 1\&e_1^j = 0) = 1 - G(2F_d^{1/2} + \tau^j + c_p^j)$.

Conversely, incumbent firms in destination d have already discovered that μ^N longer ago, and have made their entry decision by comparing maximised profits with entry costs much earlier. Hence, under this framework there is no reason to expect any positive likelihood for these firms to start exporting a new product j in $t = 2$ or in the future. This implies that $Pr(e_t^j = 1 \mid \pi_{i=1}^{t-1} e_{t-i}^A = 1\&e_{t-1}^j = 0) = 0$.

In summary, the proof of Prediction 2 on the extensive margin without trade liberalisation can be stated as follows:

$$Pr(e_2^j = 1 \mid e_1^A = 1\&e_1^j = 0) = 1-G(2F_d^{1/2}+\tau^j+c_p^j) > 0 = Pr(e_t^j = 1 \mid \pi_{i=1}^{t-1} e_{t-i}^A = 1\&e_{t-1}^j = 0). \tag{A.13}$$

A.1.2.2 With Trade Liberalisation in t=2

When tariffs are eliminated in $t = 2$ by d for country o's products, both new and expert firms will have to re-evaluate their profit analysis, since now it is less costly to export to that market. In that sense, new firms will decide to export a new product j to d in $t = 2$ if $\mu^N \geq 2F_d^{1/2} + c_p^j$. In other words, the calculation of their maximised profits will no longer consider the tariff, which is now zero. Thus, the probability that the firm will export product j to d after having exported A previously will be expressed as $Pr(e_2^j = 1 \mid e_1^A = 1 \& e_1^j = 0) = 1 - G(2F_d^{1/2} + c_p^j)$. This likelihood is clearly greater than in the case of no liberalisation. Note that this entry probability is decreasing in the production cost c_p^j. Hence, it will be larger in the case of core competence products.

As for incumbent firms, given that their cost structure also changes with trade liberalisation, they will also have to re-evaluate their entry decisions at destination d in $t = 2$. They will have to compare their maximised profits from exporting j with the sunk entry cost for that product, in order to decide whether to export it or not. Hence, like newcomers, the expert firms will export a new product j to d in $t = 2$ if $\mu^N \geq 2F_d^{1/2} + c_p^j$; and that entry probability can also be expressed as $Pr(e_2^j = 1 \mid e_1^A = 1 \& e_1^j = 0) = 1 - G(2F_d^{1/2} + c_p^j)$.

However, a crucial difference takes place between new and expert firms when comparing the scenarios with and without trade liberalisation; specifically, in the growth of their entry probabilities. While for newcomers, that probability growth is $G(2F_d^{1/2} + \tau^j + c_p^j) - G(2F_d^{1/2} + c_p^j)$; for incumbents, it will be $1 - G(2F_d^{1/2} + c_p^j)$, since without liberalisation the entry probability was zero. Thus, experts have a greater entry probability growth than new firms in a context of trade liberalisation.

For further time periods, with tariffs eliminated, since now $c_p^B < c_p^A$, new firms will tend to enter d with product B. Experts, on the other hand, will have already learnt the new scenario post-liberalisation. Hence, the entry probability with a new product j for a newcomer, expressed as $1 - G(2F_d^{1/2} + c_p^j)$, will be again greater than the zero probability for incumbents.

A.1.3 Prediction 3: Exit

A.1.3.1 Without Trade Liberalisation

Let me denote as $Pr(e_2^A = 0 \mid e_1^A = 1)$ the probability that a firm stops exporting its first product A to d right after starting exporting it. Let me also denote as $Pr(e_{t+1}^j = 0 \mid e_t^j = 1 \& e_{t-1}^j = 1)$ the probability that a firm stops exporting any product j to d, after exporting it for more than one period.

It is known from the basic model that a firm will exit the export business of product A in market d if the realised export profitability does not cover the trade and production costs $-\mu^N < \tau^A + c_p^A -$. Given that μ^N follows a cumulative distribution function $G(.)$, and that new firms are much more likely to discover that such business might not be profitable, I can express that exit probability for a new firm as $Pr(e_2^A = 0 \mid e_1^A = 1) = G(\tau^A + c_p^A)$.

As for more expert firms, as they have already realised μ^N by experimenting with product A longer ago, they know how large or small such profitability is with respect to the costs of A and many other products. Hence, under this framework, there is no reason to expect an exit by the incumbents from the export business of a particular product to d. Thus, their exit probability can be expressed as $Pr(e_{t+1}^j = 0 \mid e_t^j = 1 \& e_{t-1}^j = 1) = 0$.

In summary, the proof of Prediction 3 without trade liberalisation can be stated as follows:

$$Pr(e_2^A = 0 \mid e_1^A = 1) = G(\tau^A + c_p^A) > 0 = Pr(e_{t+1}^j = 0 \mid e_t^j = 1 \& e_{t-1}^j = 1). \tag{A.14}$$

A.1.3.2 With Trade Liberalisation in t=2

When trade liberalisation occurs in $t = 2$, τ^A becomes zero, which means that the new firm will compare the realised μ^N with the production cost c^{pA} to decide whether to continue exporting A to d or to walk away. Therefore, the exit probability for the newcomer that entered into d with product A will be reduced to $Pr(e_2^A = 0 \mid e_1^A = 1) = G(c_p^A)$. Hence, trade liberalisation makes new firms more likely to stay exporting to destination d. For expert firms, such exit probability remains in zero, since again the production costs for A and other products were already compared with the previously realised μ^N.

After trade liberalisation, newcomers will tend to enter market d with product B, which is now cheaper than A. Hence, in further time periods, the exit probability for new exporters will be even more reduced to $G(c_p^B)$; but still greater than the zero probability for incumbents. Thus, exit probability for newcomers will be lower as long as they enter market d with products in which they are more efficient, i.e. “core competence” products.

B Appendix to Chapter 4

B.1 Models 2 and 3 - Additional Estimations

Table B.1.1: Model 2 - Extensive Margin (Entry) - including fixed effects and firm i's past performance

Dependent Variable	Entry_ijt											
Estimation	LPM											
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
new_USA	0.0334	0.0329	0.0214	0.0214	0.0337	0.0332	0.0215	0.0216	0.114***	0.114***	0.107***	0.107***
	(0.0316)	(0.0316)	(0.0313)	(0.0313)	(0.0318)	(0.0318)	(0.0315)	(0.0315)	(0.0203)	(0.0203)	(0.0203)	(0.0203)
fta	-0.261	-0.243	-0.279	-0.293	-0.250	-0.233	-0.268	-0.282	-0.430**	-0.401*	-0.437*	-0.463**
	(0.210)	(0.212)	(0.229)	(0.226)	(0.211)	(0.213)	(0.230)	(0.227)	(0.214)	(0.217)	(0.232)	(0.229)
fta*new_USA	0.232	0.198	0.0845	0.0987	0.228	0.195	0.0816	0.0955	0.354	0.307	0.160	0.187
	(0.342)	(0.346)	(0.385)	(0.382)	(0.341)	(0.345)	(0.384)	(0.381)	(0.347)	(0.351)	(0.390)	(0.387)
similar_prod	0.0123	0.0122	0.00850	0.00857	0.0119	0.0118	0.00768	0.00775	0.0525***	0.0524***	0.0577**	0.0578**
	(0.0138)	(0.0139)	(0.0182)	(0.0182)	(0.0138)	(0.0139)	(0.0182)	(0.0182)	(0.0182)	(0.0182)	(0.0261)	(0.0261)
ln_lag_n_sec_exp_USA					0.104	0.104	0.108	0.108				
					(0.0746)	(0.0746)	(0.0745)	(0.0745)				
gr_ln_real_sector_USA_exports					0.0115	0.0114	0.0111	0.0112				
					(0.0138)	(0.0138)	(0.0138)	(0.0138)				
newUSA*lag1else	0.0891***	0.0896***	0.0867**	0.0867**	0.0887***	0.0892***	0.0862**	0.0861**	0.0695**	0.0700**	0.0692**	0.0692**
	(0.0338)	(0.0338)	(0.0338)	(0.0338)	(0.0338)	(0.0338)	(0.0339)	(0.0339)	(0.0337)	(0.0337)	(0.0337)	(0.0337)
core50	0.441***	0.439***	0.456***	0.458***	0.441***	0.439***	0.456***	0.457***	0.426***	0.422***	0.436***	0.439***
	(0.0206)	(0.0212)	(0.0202)	(0.0197)	(0.0206)	(0.0211)	(0.0201)	(0.0196)	(0.0181)	(0.0187)	(0.0175)	(0.0170)
newUSA*core50	-0.0711**	-0.0634*	-0.0143	-0.0157	-0.0707**	-0.0631*	-0.0141	-0.0155	-0.0621*	-0.0530	-0.00205	-0.00449
	(0.0329)	(0.0333)	(0.0368)	(0.0365)	(0.0329)	(0.0333)	(0.0368)	(0.0365)	(0.0326)	(0.0333)	(0.0370)	(0.0368)
fta*core50		-0.342	-0.262			-0.338	-0.258			-0.533	-0.464	
		(0.478)	(0.482)			(0.477)	(0.481)			(0.449)	(0.452)	
ftanewUSA*core50		1.188	1.238	0.975		1.175	1.223	0.965		1.465	1.519	1.055
		(1.498)	(1.369)	(1.284)		(1.496)	(1.367)	(1.282)		(1.510)	(1.363)	(1.283)
core50*similar			-0.253***	-0.253***			-0.253***	-0.253***			-0.240***	-0.241***
			(0.0634)	(0.0635)			(0.0635)	(0.0636)			(0.0592)	(0.0594)
newUSA*similar			0.0607**	0.0608**			0.0618**	0.0618**			0.0413	0.0413
			(0.0285)	(0.0285)			(0.0285)	(0.0285)			(0.0323)	(0.0323)
fta*similar			0.257	0.268			0.259	0.270			0.296	0.316
			(0.437)	(0.436)			(0.436)	(0.436)			(0.433)	(0.432)
ftanewUSA*similar			0.405	0.395			0.405	0.395			0.472	0.452
			(0.611)	(0.610)			(0.611)	(0.610)			(0.619)	(0.618)
lag_ln_real_ev_USA_tot	0.00700*	0.00700*	0.00750*	0.00750*	0.00690	0.00690	0.00741*	0.00740*				
	(0.00424)	(0.00424)	(0.00422)	(0.00422)	(0.00424)	(0.00424)	(0.00421)	(0.00421)				
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ATPDEA and MFN dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	24530	24530	24530	24530	24530	24530	24530	24530	28488	28488	28488	28488
r2_o	0.197	0.197	0.199	0.199	0.197	0.197	0.199	0.199	0.220	0.220	0.221	0.221
N_clust	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table B.1.2: Model 3 - Exit (core competence in t) - additional regressions

Dependent Variable	Exit_ijt					
Estimation	LPM					
Column	(1)	(2)	(3)	(4)	(5)	(6)
new_USA	0.114***	0.115***	0.114***	0.113***	0.114***	0.114***
	(0.0245)	(0.0246)	(0.0246)	(0.0179)	(0.0179)	(0.0179)
fta	0.0778	0.0778	0.133	0.0295	0.0289	0.0455
	(0.270)	(0.270)	(0.290)	(0.165)	(0.165)	(0.181)
fta*new_USA	-0.0950	0.00361	-0.0519	0.540*	0.591**	0.574*
	(0.426)	(0.451)	(0.464)	(0.276)	(0.289)	(0.298)
newUSA*lag1else	0.0228	0.0230	0.0230	-0.0881***	-0.0880***	-0.0880***
	(0.0307)	(0.0307)	(0.0307)	(0.0223)	(0.0223)	(0.0223)
core50	-0.483***	-0.483***	-0.486***	-0.392***	-0.392***	-0.393***
	(0.0115)	(0.0115)	(0.0115)	(0.0121)	(0.0121)	(0.0123)
newUSA*core50	-0.0507*	-0.0606**	-0.0583**	-0.153***	-0.157***	-0.157***
	(0.0273)	(0.0276)	(0.0275)	(0.0237)	(0.0242)	(0.0243)
fta*core50			-0.447			-0.139
			(0.349)			(0.299)
ftanewUSA*core50		-0.985*	-0.539		-0.483	-0.345
		(0.519)	(0.618)		(0.442)	(0.530)
lag_ln_real_ev				0.0591***	0.0591***	0.0591***
				(0.00168)	(0.00168)	(0.00168)
Year FE	Yes	Yes	Yes	No	No	No
Sector FE	Yes	Yes	Yes	No	No	No
ATPDEA and MFN dummies	Yes	Yes	Yes	No	No	No
N	31882	31882	31882	27434	27434	27434
r2_o	0.126	0.126	0.126	0.263	0.263	0.263
N_clust	2599	2599	2599	2599	2599	2599

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table B.1.3: Model 3 - Exit - controlling for core products in year t-1

Dependent Variable	Exit_ijt					
Estimation	LPM					
Column	(1)	(2)	(3)	(4)	(5)	(6)
new_USA	0.210***	0.208***	0.208***	0.214***	0.212***	0.212***
	(0.0272)	(0.0273)	(0.0273)	(0.0169)	(0.0170)	(0.0170)
newUSA*lag1else	-0.102***	-0.102***	-0.101***	-0.151***	-0.150***	-0.150***
	(0.0288)	(0.0288)	(0.0288)	(0.0200)	(0.0200)	(0.0200)
lag1*core50	0.194***	0.194***	0.198***	-0.167***	-0.166***	-0.165***
	(0.0181)	(0.0181)	(0.0184)	(0.0176)	(0.0176)	(0.0179)
newUSA*lag1core50	0.0507	0.0605*	0.0570*	0.0758***	0.0832***	0.0823***
	(0.0309)	(0.0315)	(0.0316)	(0.0218)	(0.0222)	(0.0224)
fta	-0.0468	-0.0440	-0.0971	-0.181	-0.180	-0.194
	(0.245)	(0.245)	(0.258)	(0.170)	(0.170)	(0.173)
fta*new_USA	0.991**	0.807*	0.862*	0.785***	0.645**	0.659**
	(0.412)	(0.445)	(0.452)	(0.262)	(0.280)	(0.282)
fta*lag1core50			0.569			0.141
			(0.469)			(0.407)
ftanewUSA*lag1core50		1.252**	0.682		0.952**	0.811
		(0.531)	(0.706)		(0.419)	(0.587)
lag_ln_real_ev				0.0530***	0.0530***	0.0530***
				(0.00192)	(0.00192)	(0.00192)
Year FE	No	No	No	Yes	Yes	Yes
Sector FE	No	No	No	Yes	Yes	Yes
ATPDEA and MFN dummies	No	No	No	Yes	Yes	Yes
N	27547	27547	27547	27434	27434	27434
r2_o	0.0637	0.0637	0.0637	0.192	0.192	0.192
N_clust	2599	2599	2599	2599	2599	2599

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table B.1.4: Model 3 - Exit (core competence in t-1) - additional regressions

Dependent Variable	Exit_ijt					
Estimation	LPM					
Column	(1)	(2)	(3)	(4)	(5)	(6)
new_USA	0.318***	0.316***	0.316***	0.141***	0.139***	0.139***
	(0.0206)	(0.0207)	(0.0207)	(0.0179)	(0.0180)	(0.0180)
fta	-0.385*	-0.385*	-0.427*	0.0648	0.0672	0.0603
	(0.221)	(0.221)	(0.230)	(0.162)	(0.162)	(0.166)
fta*new_USA	1.123***	0.993***	1.036***	0.652**	0.488*	0.496*
	(0.348)	(0.378)	(0.384)	(0.270)	(0.287)	(0.289)
newUSA*lag1else	-0.0889***	-0.0886***	-0.0885***	-0.176***	-0.176***	-0.176***
	(0.0244)	(0.0244)	(0.0244)	(0.0212)	(0.0212)	(0.0212)
lag1*core50	0.0619***	0.0623***	0.0652***	-0.165***	-0.164***	-0.164***
	(0.0160)	(0.0160)	(0.0162)	(0.0182)	(0.0182)	(0.0184)
newUSA*lag1core50	0.0896***	0.0965***	0.0937***	0.0590**	0.0677***	0.0672***
	(0.0248)	(0.0251)	(0.0252)	(0.0240)	(0.0246)	(0.0248)
fta*lag1core50			0.447			0.0750
			(0.405)			(0.442)
ftanewUSA*lag1core50		0.882*	0.435		1.110**	1.035*
		(0.479)	(0.623)		(0.431)	(0.622)
lag_ln_real_ev				0.0651***	0.0651***	0.0651***
				(0.00202)	(0.00202)	(0.00202)
Year FE	Yes	Yes	Yes	No	No	No
Sector FE	Yes	Yes	Yes	No	No	No
ATPDEA and MFN dummies	Yes	Yes	Yes	No	No	No
N	27547	27547	27547	27434	27434	27434
r2_o	0.0672	0.0673	0.0673	0.204	0.204	0.204
N_clust	2599	2599	2599	2599	2599	2599

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

B.2 Models 2 and 3 Including Interactions Between Core50 Dummies and Firm Size - Additional Estimations

Table B.2.1: Model 2 - Extensive Margin (Entry) - including interactions between core50 and firm size - additional estimations

Dependent Variable	Entry_ijt											
Estimation	LPM											
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
new_USA	0.0310	0.0309	0.0206	0.0206	0.0314	0.0312	0.0207	0.0208	0.113***	0.113***	0.107***	0.107***
	(0.0315)	(0.0315)	(0.0313)	(0.0313)	(0.0317)	(0.0317)	(0.0315)	(0.0315)	(0.0203)	(0.0203)	(0.0204)	(0.0203)
fta	-0.254	-0.241	-0.279	-0.289	-0.242	-0.230	-0.268	-0.278	-0.423**	-0.401*	-0.439*	-0.460**
	(0.209)	(0.212)	(0.229)	(0.226)	(0.210)	(0.213)	(0.230)	(0.227)	(0.214)	(0.217)	(0.232)	(0.228)
fta*new_USA	0.228	0.214	0.0937	0.104	0.224	0.211	0.0906	0.100	0.351	0.324	0.171	0.192
	(0.340)	(0.345)	(0.385)	(0.381)	(0.339)	(0.345)	(0.384)	(0.380)	(0.345)	(0.351)	(0.390)	(0.387)
similar_prod	0.0158	0.0158	0.0106	0.0106	0.0154	0.0154	0.00969	0.00974	0.0562***	0.0562***	0.0602**	0.0603**
	(0.0137)	(0.0137)	(0.0182)	(0.0182)	(0.0137)	(0.0137)	(0.0182)	(0.0182)	(0.0180)	(0.0181)	(0.0261)	(0.0261)
ln_lag_n_sec_exp_USA					0.110	0.110	0.113	0.113				
					(0.0747)	(0.0747)	(0.0746)	(0.0745)				
gr_ln_real_sector_USA_exports					0.0112	0.0112	0.0109	0.0109				
					(0.0137)	(0.0137)	(0.0137)	(0.0137)				
newUSA*lag1else	0.0991***	0.0992***	0.0950***	0.0949***	0.0988***	0.0988***	0.0945***	0.0945***	0.0771**	0.0771**	0.0748**	0.0748**
	(0.0344)	(0.0344)	(0.0345)	(0.0345)	(0.0345)	(0.0344)	(0.0345)	(0.0345)	(0.0344)	(0.0344)	(0.0344)	(0.0344)
core50	0.568***	0.566***	0.573***	0.574***	0.568***	0.566***	0.573***	0.574***	0.563***	0.560***	0.565***	0.568***
	(0.0240)	(0.0244)	(0.0245)	(0.0241)	(0.0239)	(0.0243)	(0.0245)	(0.0240)	(0.0215)	(0.0220)	(0.0220)	(0.0216)
core50*small	-0.149***	-0.149***	-0.141***	-0.141***	-0.149***	-0.149***	-0.142***	-0.142***	-0.156***	-0.155***	-0.149***	-0.149***
	(0.0365)	(0.0365)	(0.0351)	(0.0351)	(0.0365)	(0.0365)	(0.0351)	(0.0351)	(0.0354)	(0.0353)	(0.0339)	(0.0340)
core50*medium	-0.248***	-0.249***	-0.236***	-0.236***	-0.248***	-0.249***	-0.237***	-0.236***	-0.268***	-0.268***	-0.260***	-0.259***
	(0.0432)	(0.0432)	(0.0421)	(0.0422)	(0.0432)	(0.0433)	(0.0422)	(0.0422)	(0.0386)	(0.0386)	(0.0375)	(0.0376)
core50*large	-0.440***	-0.438***	-0.409***	-0.410***	-0.441***	-0.439***	-0.410***	-0.411***	-0.440***	-0.438***	-0.415***	-0.417***
	(0.0732)	(0.0733)	(0.0666)	(0.0664)	(0.0733)	(0.0734)	(0.0666)	(0.0665)	(0.0645)	(0.0646)	(0.0590)	(0.0588)
newUSA*core50	-0.0954**	-0.0937**	-0.0665*	-0.0676*	-0.0945**	-0.0928**	-0.0657	-0.0668*	-0.113***	-0.110***	-0.0819**	-0.0841**
	(0.0370)	(0.0376)	(0.0400)	(0.0397)	(0.0370)	(0.0376)	(0.0400)	(0.0397)	(0.0364)	(0.0370)	(0.0395)	(0.0392)
newUSA*core50*small	0.0666	0.0669	0.105	0.105	0.0661	0.0662	0.104	0.104	0.0837	0.0849	0.121*	0.121*
	(0.0712)	(0.0710)	(0.0691)	(0.0691)	(0.0712)	(0.0710)	(0.0691)	(0.0691)	(0.0682)	(0.0682)	(0.0654)	(0.0653)
newUSA*core50*medium	-0.0990	-0.0977	-0.0862	-0.0864	-0.101	-0.0995	-0.0882	-0.0883	-0.0232	-0.0192	-0.00376	-0.00368
	(0.0895)	(0.0908)	(0.0902)	(0.0902)	(0.0893)	(0.0905)	(0.0899)	(0.0899)	(0.0873)	(0.0890)	(0.0890)	(0.0890)
newUSA*core50*large	0.167	0.166	0.175	0.176	0.166	0.165	0.174	0.175	0.196*	0.194*	0.214*	0.216*
	(0.122)	(0.122)	(0.124)	(0.124)	(0.122)	(0.122)	(0.123)	(0.123)	(0.116)	(0.116)	(0.118)	(0.118)
core50*similar		-0.247	-0.184			-0.242	-0.179			-0.412	-0.358	
		(0.460)	(0.466)			(0.460)	(0.466)			(0.437)	(0.442)	
fta*core50		0.317	0.411	0.228		0.299	0.390	0.211		0.689	0.788	0.432
		(1.586)	(1.427)	(1.354)		(1.583)	(1.425)	(1.352)		(1.596)	(1.417)	(1.348)
ftanewUSA*core50			-0.200***	-0.201***			-0.200***	-0.200***			-0.193***	-0.194***
			(0.0551)	(0.0551)			(0.0552)	(0.0552)			(0.0510)	(0.0511)
newUSA*similar			0.0568**	0.0568**			0.0580**	0.0580**			0.0370	0.0370
			(0.0285)	(0.0285)			(0.0285)	(0.0285)			(0.0322)	(0.0322)
fta*similar			0.280	0.287			0.282	0.289			0.320	0.336
			(0.437)	(0.436)			(0.437)	(0.436)			(0.433)	(0.432)
ftanewUSA*similar			0.401	0.394			0.402	0.395			0.462	0.447
			(0.613)	(0.613)			(0.614)	(0.613)			(0.622)	(0.621)
lag_ln_real_ev_USA_tot	0.00710*	0.00710*	0.00754*	0.00754*	0.00699*	0.00699*	0.00743*	0.00743*				
	(0.00423)	(0.00423)	(0.00421)	(0.00421)	(0.00422)	(0.00422)	(0.00420)	(0.00420)				
Firm Size dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ATPDEA and MFN dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	24530	24530	24530	24530	24530	24530	24530	24530	28488	28488	28488	28488
r2_o	0.208	0.208	0.210	0.210	0.208	0.208	0.210	0.210	0.229	0.229	0.230	0.230
N_clust	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table B.2.2: Model 3 - Exit (core competence in t) - including interactions between core50 and firm size - additional estimations

Dependent Variable	Exit_ijt					
Estimation	LPM					
Column	(1)	(2)	(3)	(4)	(5)	(6)
new_USA	0.103***	0.104***	0.103***	0.116***	0.116***	0.116***
	(0.0249)	(0.0249)	(0.0249)	(0.0181)	(0.0181)	(0.0181)
fta	0.0917	0.0917	0.135	0.0332	0.0324	0.0456
	(0.270)	(0.270)	(0.291)	(0.164)	(0.164)	(0.181)
fta*new_USA	-0.139	-0.0608	-0.104	0.530*	0.588**	0.574*
	(0.425)	(0.450)	(0.463)	(0.276)	(0.288)	(0.298)
newUSA*lag1else	0.0288	0.0290	0.0290	-0.0951***	-0.0950***	-0.0950***
	(0.0317)	(0.0317)	(0.0317)	(0.0230)	(0.0230)	(0.0230)
core50	-0.616***	-0.616***	-0.618***	-0.371***	-0.371***	-0.371***
	(0.0157)	(0.0157)	(0.0158)	(0.0151)	(0.0151)	(0.0152)
core50*small	0.204***	0.203***	0.202***	-0.00243	-0.00317	-0.00358
	(0.0212)	(0.0212)	(0.0211)	(0.0205)	(0.0205)	(0.0204)
core50*medium	0.264***	0.263***	0.263***	-0.0425	-0.0433	-0.0434
	(0.0257)	(0.0258)	(0.0257)	(0.0310)	(0.0310)	(0.0310)
core50*large	0.363***	0.362***	0.362***	-0.145**	-0.146**	-0.146**
	(0.0350)	(0.0351)	(0.0351)	(0.0568)	(0.0568)	(0.0568)
newUSA*core50	0.0139	0.00712	0.00872	-0.174***	-0.179***	-0.178***
	(0.0347)	(0.0347)	(0.0347)	(0.0304)	(0.0306)	(0.0306)
newUSA*core50*small	-0.0854**	-0.0883**	-0.0877**	-0.0303	-0.0326	-0.0324
	(0.0369)	(0.0370)	(0.0369)	(0.0366)	(0.0367)	(0.0366)
newUSA*core50*medium	-0.122***	-0.122***	-0.122***	0.0481	0.0478	0.0478
	(0.0423)	(0.0421)	(0.0422)	(0.0410)	(0.0409)	(0.0409)
newUSA*core50*large	-0.104*	-0.103*	-0.104*	0.228***	0.228***	0.228***
	(0.0582)	(0.0582)	(0.0582)	(0.0567)	(0.0568)	(0.0568)
fta*core50			-0.352			-0.110
			(0.340)			(0.294)
ftanewUSA*core50		-0.778	-0.427		-0.550	-0.441
		(0.530)	(0.620)		(0.444)	(0.529)
lag_ln_real_ev				0.0596***	0.0596***	0.0596***
				(0.00174)	(0.00174)	(0.00174)
Firm Size dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	No	No	No
Sector FE	Yes	Yes	Yes	No	No	No
ATPDEA and MFN dummies	Yes	Yes	Yes	No	No	No
N	31882	31882	31882	27434	27434	27434
r2_o	0.0559	0.0560	0.0559	0.200	0.200	0.200
N_clust	2599	2599	2599	2599	2599	2599

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level; ***Denotes statistical significance at the 1% level.

Table B.2.3: Model 3: Exit (core competence in t-1) - including interactions between core50 and firm size

Dependent Variable	Exit_ijt					
Estimation	LPM					
Column	(1)	(2)	(3)	(4)	(5)	(6)
new_USA	0.201***	0.200***	0.200***	0.203***	0.203***	0.203***
	(0.0273)	(0.0274)	(0.0275)	(0.0170)	(0.0171)	(0.0171)
fta	-0.0509	-0.0499	-0.0996	-0.156	-0.156	-0.169
	(0.245)	(0.245)	(0.258)	(0.169)	(0.169)	(0.173)
fta*new_USA	0.974**	0.895**	0.946**	0.736***	0.692**	0.705**
	(0.410)	(0.446)	(0.453)	(0.261)	(0.278)	(0.281)
newUSA*lag1else	-0.0369	-0.0370	-0.0369	-0.109***	-0.109***	-0.109***
	(0.0310)	(0.0310)	(0.0310)	(0.0210)	(0.0211)	(0.0210)
lag1*core50	0.489***	0.489***	0.492***	0.123***	0.123***	0.124***
	(0.0279)	(0.0279)	(0.0281)	(0.0256)	(0.0256)	(0.0257)
lag1core50*small	-0.365***	-0.365***	-0.362***	-0.349***	-0.349***	-0.348***
	(0.0372)	(0.0372)	(0.0373)	(0.0328)	(0.0328)	(0.0328)
lag1core50*medium	-0.520***	-0.519***	-0.519***	-0.510***	-0.510***	-0.510***
	(0.0365)	(0.0365)	(0.0365)	(0.0360)	(0.0361)	(0.0361)
lag1core50*large	-0.659***	-0.658***	-0.659***	-0.631***	-0.631***	-0.631***
	(0.0379)	(0.0380)	(0.0381)	(0.0532)	(0.0532)	(0.0532)
newUSA*lag1core50	-0.0226	-0.0192	-0.0221	-0.0393	-0.0375	-0.0382
	(0.0393)	(0.0396)	(0.0398)	(0.0287)	(0.0288)	(0.0290)
newUSA*lag1core50*small	-0.146***	-0.142***	-0.144***	-0.0890**	-0.0870**	-0.0875**
	(0.0454)	(0.0455)	(0.0455)	(0.0398)	(0.0400)	(0.0400)
newUSA*lag1core50*medium	-0.0978**	-0.0963*	-0.0958*	0.0262	0.0270	0.0272
	(0.0495)	(0.0496)	(0.0496)	(0.0440)	(0.0440)	(0.0440)
newUSA*lag1core50*large	-0.116*	-0.117*	-0.116*	0.177***	0.177***	0.177***
	(0.0607)	(0.0608)	(0.0609)	(0.0610)	(0.0610)	(0.0610)
fta*lag1core50			0.536			0.134
			(0.449)			(0.389)
ftanewUSA*lag1core50		0.539	0.00254		0.300	0.166
		(0.502)	(0.666)		(0.393)	(0.555)
lag_ln_real_ev				0.0540***	0.0540***	0.0540***
				(0.00193)	(0.00193)	(0.00193)
Firm Size dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	Yes	Yes	Yes
Sector FE	No	No	No	Yes	Yes	Yes
ATPDEA and MFN dummies	No	No	No	Yes	Yes	Yes
N	27547	27547	27547	27434	27434	27434
r2_o	0.0846	0.0846	0.0845	0.195	0.195	0.195
N_clust	2599	2599	2599	2599	2599	2599

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table B.2.4: Model 3 - Exit (core competence in t-1) - including interactions between core50 and firm size - additional estimations

Dependent Variable	Exit_ijt					
Estimation	LPM					
Column	(1)	(2)	(3)	(4)	(5)	(6)
new_USA	0.309***	0.309***	0.309***	0.133***	0.133***	0.133***
	(0.0209)	(0.0209)	(0.0209)	(0.0180)	(0.0180)	(0.0180)
fta	-0.370*	-0.370*	-0.409*	0.0676	0.0683	0.0602
	(0.222)	(0.222)	(0.231)	(0.161)	(0.161)	(0.165)
fta*new_USA	1.094***	1.047***	1.086***	0.613**	0.560**	0.569**
	(0.349)	(0.379)	(0.385)	(0.269)	(0.285)	(0.288)
newUSA*lag1else	-0.0495*	-0.0496*	-0.0495*	-0.120***	-0.120***	-0.120***
	(0.0260)	(0.0260)	(0.0260)	(0.0225)	(0.0225)	(0.0225)
lag1*core50	0.326***	0.326***	0.328***	0.151***	0.151***	0.151***
	(0.0256)	(0.0256)	(0.0257)	(0.0262)	(0.0262)	(0.0263)
lag1core50*small	-0.327***	-0.327***	-0.325***	-0.373***	-0.373***	-0.372***
	(0.0348)	(0.0349)	(0.0349)	(0.0340)	(0.0340)	(0.0340)
lag1core50*medium	-0.459***	-0.459***	-0.459***	-0.557***	-0.557***	-0.557***
	(0.0335)	(0.0336)	(0.0336)	(0.0392)	(0.0392)	(0.0392)
lag1core50*large	-0.527***	-0.527***	-0.527***	-0.728***	-0.728***	-0.728***
	(0.0421)	(0.0421)	(0.0421)	(0.0559)	(0.0559)	(0.0560)
newUSA*lag1core50	-0.0154	-0.0134	-0.0156	-0.0450	-0.0428	-0.0432
	(0.0328)	(0.0329)	(0.0331)	(0.0305)	(0.0307)	(0.0309)
newUSA*lag1core50*small	-0.0584	-0.0563	-0.0578	-0.137***	-0.134***	-0.135***
	(0.0426)	(0.0427)	(0.0427)	(0.0404)	(0.0406)	(0.0406)
newUSA*lag1core50*medium	0.0279	0.0287	0.0291	-0.0297	-0.0287	-0.0286
	(0.0463)	(0.0464)	(0.0464)	(0.0445)	(0.0445)	(0.0445)
newUSA*lag1core50*large	0.0968	0.0962	0.0972	0.0949	0.0942	0.0944
	(0.0623)	(0.0622)	(0.0623)	(0.0615)	(0.0615)	(0.0615)
fta*lag1core50			0.412			0.0878
			(0.396)			(0.414)
ftanewUSA*lag1core50		0.321	-0.0919		0.361	0.273
		(0.460)	(0.600)		(0.398)	(0.579)
lag_ln_real_ev				0.0652***	0.0652***	0.0652***
				(0.00203)	(0.00203)	(0.00203)
Firm Size dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	No	No	No
Sector FE	Yes	Yes	Yes	No	No	No
ATPDEA and MFN dummies	Yes	Yes	Yes	No	No	No
N	27547	27547	27547	27434	27434	27434
r2_o	0.0909	0.0910	0.0910	0.222	0.222	0.222
N_clust	2599	2599	2599	2599	2599	2599

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level; ***Denotes statistical significance at the 1% level.

B.3 Estimations Including Core25 Variables

Table B.3.1: Model 1 - Intensive Margin - including core25 variables

Dependent Variable	Δln_real_ev							
Estimation	Firm FE Robust							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
new_USA	2.327***	2.382***	2.228***	2.227***	1.247***	1.282***	1.208***	1.208***
	(0.273)	(0.271)	(0.270)	(0.269)	(0.237)	(0.233)	(0.229)	(0.230)
fta	-5.236**	-5.256**	-5.208*	-5.010*	-3.188	-3.193	-3.128	-3.085
	(2.665)	(2.665)	(2.676)	(2.934)	(2.400)	(2.400)	(2.402)	(2.553)
fta*new_USA	6.809	10.30*	11.04*	10.84*	2.688	4.796	4.972	4.930
	(4.754)	(5.876)	(5.932)	(6.022)	(4.054)	(5.062)	(5.038)	(5.117)
newUSA*lag2else	-2.373***	-2.367***			-0.888**	-0.885**		
	(0.429)	(0.428)			(0.357)	(0.356)		
lag1_core25	-3.941***	-3.948***	-3.882***	-3.888***	-2.276***	-2.281***	-2.253***	-2.255***
	(0.180)	(0.180)	(0.179)	(0.181)	(0.137)	(0.137)	(0.136)	(0.137)
newUSA*lag1core25	0.311	0.153	-0.222	-0.216	0.0549	-0.0400	-0.177	-0.176
	(0.316)	(0.318)	(0.334)	(0.333)	(0.273)	(0.274)	(0.272)	(0.274)
fta*lag1core25				-0.956				-0.197
				(4.239)				(3.372)
ftanewUSA*lag1core25		-10.82*	-11.12**	-10.16		-6.497	-6.573	-6.376
		(5.597)	(5.592)	(6.878)		(5.090)	(5.080)	(6.083)
lag_ln_real_ev_USA_tot					-0.540***	-0.540***	-0.540***	-0.540***
					(0.0204)	(0.0204)	(0.0205)	(0.0205)
Year FE	No	No	No	No	Yes	Yes	Yes	Yes
Sector FE	No	No	No	No	Yes	Yes	Yes	Yes
ATPDEA and MFN dummies	No	No	No	No	Yes	Yes	Yes	Yes
N	17077	17077	17077	17077	17077	17077	17077	17077
r2_o	0.0421	0.0420	0.0417	0.0417	0.172	0.172	0.172	0.172
N_clust	1000	1000	1000	1000	1000	1000	1000	1000

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table B.3.2: Model 2 - Extensive Margin (Entry) - including core25 variables

Dependent Variable	Entry_ijt							
Estimation	LPM							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
new_USA	0.170***	0.170***	0.191***	0.190***	0.167***	0.167***	0.188***	0.187***
	(0.0360)	(0.0362)	(0.0378)	(0.0378)	(0.0360)	(0.0362)	(0.0379)	(0.0378)
fta	-0.655***	-0.721***	-0.839***	-0.766***	-0.553***	-0.618***	-0.735***	-0.663***
	(0.214)	(0.216)	(0.232)	(0.230)	(0.213)	(0.215)	(0.232)	(0.230)
fta*new_USA	1.283***	1.344***	1.258**	1.183**	1.256***	1.317***	1.235**	1.162**
	(0.442)	(0.456)	(0.501)	(0.498)	(0.440)	(0.454)	(0.499)	(0.496)
similar_prod	0.204***	0.204***	0.331***	0.332***	0.202***	0.201***	0.329***	0.329***
	(0.0206)	(0.0206)	(0.0277)	(0.0277)	(0.0207)	(0.0208)	(0.0278)	(0.0278)
ln_lag_n_sec_exp_USA					0.0409***	0.0407***	0.0390***	0.0392***
					(0.00684)	(0.00684)	(0.00689)	(0.00689)
gr_ln_real_sector_USA_exports					-0.0314**	-0.0313**	-0.0320**	-0.0321**
					(0.0150)	(0.0150)	(0.0150)	(0.0150)
newUSA*lag1else	0.0680*	0.0681*	0.0884**	0.0884**	0.0685*	0.0685*	0.0888**	0.0888**
	(0.0387)	(0.0387)	(0.0379)	(0.0379)	(0.0386)	(0.0386)	(0.0379)	(0.0379)
core25	0.522***	0.528***	0.540***	0.534***	0.520***	0.525***	0.537***	0.532***
	(0.0181)	(0.0186)	(0.0178)	(0.0174)	(0.0182)	(0.0186)	(0.0178)	(0.0174)
newUSA*core25	-0.0868**	-0.0911**	0.000960	0.00654	-0.0859**	-0.0903**	0.00186	0.00728
	(0.0403)	(0.0424)	(0.0422)	(0.0418)	(0.0402)	(0.0423)	(0.0422)	(0.0418)
fta*core25		0.779	0.814			0.755	0.789	
		(0.516)	(0.517)			(0.516)	(0.518)	
ftanewUSA*core25		-0.664	-0.619	0.199		-0.663	-0.615	0.179
		(1.125)	(0.975)	(0.812)		(1.121)	(0.973)	(0.810)
core25*similar			-0.282***	-0.282***			-0.283***	-0.283***
			(0.0501)	(0.0499)			(0.0502)	(0.0499)
newUSA*similar			-0.241***	-0.241***			-0.240***	-0.240***
			(0.0398)	(0.0398)			(0.0398)	(0.0398)
fta*similar			1.561***	1.522***			1.547***	1.510***
			(0.454)	(0.457)			(0.457)	(0.459)
ftanewUSA*similar			-1.123*	-1.085			-1.132*	-1.095
			(0.670)	(0.671)			(0.670)	(0.671)
N	28488	28488	28488	28488	28488	28488	28488	28488
r2_o	0.120	0.120	0.127	0.127	0.121	0.121	0.128	0.128
N_clust	1158	1158	1158	1158	1158	1158	1158	1158

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table B.3.3: Model 3 - Exit (core competence in t) - including core25 variables

Dependent Variable	Exit_ijt					
Estimation	LPM					
Column	(1)	(2)	(3)	(4)	(5)	(6)
new_USA	0.165***	0.167***	0.166***	0.176***	0.176***	0.177***
	(0.0248)	(0.0249)	(0.0249)	(0.0177)	(0.0177)	(0.0177)
fta	0.154	0.153	0.252	-0.255	-0.255	-0.271
	(0.257)	(0.257)	(0.303)	(0.170)	(0.170)	(0.190)
fta*new_USA	0.662	0.802*	0.700	0.681***	0.711**	0.727**
	(0.415)	(0.457)	(0.483)	(0.261)	(0.283)	(0.296)
newUSA*lag1else	0.0426	0.0424	0.0423	-0.0366*	-0.0367*	-0.0367*
	(0.0307)	(0.0307)	(0.0307)	(0.0206)	(0.0206)	(0.0205)
core25	-0.502***	-0.502***	-0.506***	-0.356***	-0.356***	-0.356***
	(0.0112)	(0.0112)	(0.0114)	(0.0105)	(0.0105)	(0.0108)
newUSA*core25	-0.0675**	-0.0768***	-0.0739***	-0.147***	-0.149***	-0.149***
	(0.0280)	(0.0280)	(0.0280)	(0.0210)	(0.0212)	(0.0212)
fta*core25			-0.484			0.0762
			(0.324)			(0.234)
ftanewUSA*core25		-0.801*	-0.317		-0.163	-0.239
		(0.471)	(0.563)		(0.380)	(0.439)
lag_ln_real_ev				0.0496***	0.0495***	0.0495***
				(0.00157)	(0.00157)	(0.00157)
Year FE	No	No	No	Yes	Yes	Yes
Sector FE	No	No	No	Yes	Yes	Yes
ATPDEA and MFN dummies	No	No	No	Yes	Yes	Yes
N	31882	31882	31882	27434	27434	27434
r2_o	0.0986	0.131	0.0986	0.275	0.275	0.275
N_clust	2599	2599	2599	2599	2599	2599

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

B.4 Estimations Including Core10 Variables

Table B.4.1: Model 1 - Intensive Margin - including core10 variables

Dependent Variable	Δln_real_ev							
Estimation	Firm FE Robust							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
new_USA	2.574***	2.615***	2.493***	2.495***	1.391***	1.413***	1.354***	1.358***
	(0.290)	(0.289)	(0.289)	(0.288)	(0.245)	(0.239)	(0.235)	(0.236)
fta	-6.812***	-6.820***	-6.739***	-7.000**	-4.213*	-4.216*	-4.148*	-4.623*
	(2.510)	(2.510)	(2.522)	(2.892)	(2.320)	(2.320)	(2.323)	(2.661)
fta*new_USA	9.128**	11.67*	12.21**	12.47**	3.733	5.016	5.112	5.578
	(4.608)	(6.153)	(6.163)	(6.259)	(4.008)	(5.416)	(5.395)	(5.548)
newUSA*lag2else	-2.271***	-2.272***			-0.814**	-0.815**		
	(0.439)	(0.439)			(0.363)	(0.362)		
lag1_core10	-3.994***	-3.997***	-3.942***	-3.936***	-2.412***	-2.413***	-2.390***	-2.379***
	(0.179)	(0.179)	(0.178)	(0.178)	(0.135)	(0.135)	(0.134)	(0.135)
newUSA*lag1core10	0.0335	-0.0550	-0.393	-0.398	-0.211	-0.255	-0.373	-0.383
	(0.305)	(0.307)	(0.321)	(0.320)	(0.251)	(0.247)	(0.247)	(0.249)
fta*lag1core10				0.780				1.368
				(3.772)				(2.932)
ftanewUSA*lag1core10		-5.846	-5.814	-6.595		-2.929	-2.885	-4.253
		(5.479)	(5.346)	(6.450)		(5.015)	(4.975)	(5.784)
lag_ln_real_ev_USA_tot					-0.518***	-0.518***	-0.519***	-0.519***
					(0.0199)	(0.0199)	(0.0199)	(0.0199)
Year FE	No	No	No	No	Yes	Yes	Yes	Yes
Sector FE	No	No	No	No	Yes	Yes	Yes	Yes
ATPDEA and MFN dummies	No	No	No	No	Yes	Yes	Yes	Yes
N	17077	17077	17077	17077	17077	17077	17077	17077
r2_o	0.0644	0.0643	0.0650	0.0651	0.182	0.182	0.182	0.182
N_clust	1000	1000	1000	1000	1000	1000	1000	1000

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table B.4.2: Model 2 - Extensive Margin (Entry) - including core10 variables

Dependent Variable	Entry_ijt							
Estimation	LPM							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
new_USA	0.164***	0.164***	0.182***	0.182***	0.161***	0.161***	0.179***	0.179***
	(0.0370)	(0.0373)	(0.0389)	(0.0388)	(0.0370)	(0.0373)	(0.0389)	(0.0389)
fta	-0.484**	-0.543***	-0.644***	-0.582***	-0.392**	-0.448**	-0.549**	-0.490**
	(0.200)	(0.202)	(0.215)	(0.214)	(0.199)	(0.201)	(0.216)	(0.214)
fta*new_USA	1.074**	1.125**	1.051**	0.988**	1.049**	1.099**	1.029**	0.969*
	(0.432)	(0.461)	(0.504)	(0.500)	(0.430)	(0.460)	(0.503)	(0.499)
similar_prod	0.190***	0.189***	0.325***	0.325***	0.188***	0.187***	0.323***	0.323***
	(0.0206)	(0.0206)	(0.0279)	(0.0279)	(0.0208)	(0.0208)	(0.0280)	(0.0280)
ln_lag_n_sec_exp_USA					0.0356***	0.0356***	0.0339***	0.0340***
					(0.00655)	(0.00655)	(0.00663)	(0.00664)
gr_ln_real_sector_USA_exports					-0.0293**	-0.0292**	-0.0299**	-0.0300**
					(0.0145)	(0.0145)	(0.0145)	(0.0145)
newUSA*lag1else	0.0442	0.0443	0.0652*	0.0652*	0.0446	0.0446	0.0656*	0.0655*
	(0.0399)	(0.0400)	(0.0392)	(0.0392)	(0.0398)	(0.0399)	(0.0391)	(0.0391)
core10	0.550***	0.553***	0.565***	0.562***	0.548***	0.551***	0.563***	0.560***
	(0.0168)	(0.0170)	(0.0164)	(0.0161)	(0.0168)	(0.0171)	(0.0164)	(0.0161)
newUSA*core10	-0.0646*	-0.0669	0.00955	0.0128	-0.0631*	-0.0653	0.0111	0.0142
	(0.0382)	(0.0409)	(0.0403)	(0.0399)	(0.0381)	(0.0408)	(0.0402)	(0.0398)
fta*core10		0.375	0.380			0.356	0.362	
		(0.395)	(0.391)			(0.395)	(0.391)	
ftanewUSA*core10		-0.290	-0.174	0.208		-0.285	-0.166	0.197
		(0.822)	(0.727)	(0.593)		(0.820)	(0.725)	(0.591)
core10*similar			-0.270***	-0.270***			-0.270***	-0.270***
			(0.0418)	(0.0418)			(0.0418)	(0.0418)
newUSA*similar			-0.232***	-0.232***			-0.231***	-0.231***
			(0.0396)	(0.0396)			(0.0396)	(0.0396)
fta*similar			1.416***	1.395***			1.404***	1.384***
			(0.440)	(0.444)			(0.442)	(0.446)
ftanewUSA*similar			-1.062	-1.041			-1.071	-1.051
			(0.653)	(0.656)			(0.654)	(0.656)
N	28488	28488	28488	28488	28488	28488	28488	28488
r2_o	0.162	0.162	0.170	0.170	0.163	0.163	0.171	0.171
N_clust	1158	1158	1158	1158	1158	1158	1158	1158

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table B.4.3: Model 3 - Exit (core competence in t) - including core10 variables

Dependent Variable	Exit_ijt					
Estimation	LPM					
Column	(1)	(2)	(3)	(4)	(5)	(6)
new_USA	0.150***	0.152***	0.151***	0.160***	0.160***	0.160***
	(0.0251)	(0.0252)	(0.0253)	(0.0185)	(0.0185)	(0.0185)
fta	0.0481	0.0477	0.112	-0.295*	-0.295*	-0.301
	(0.238)	(0.238)	(0.319)	(0.164)	(0.164)	(0.202)
fta*new_USA	0.719*	0.877*	0.812*	0.685***	0.712**	0.718**
	(0.381)	(0.448)	(0.493)	(0.242)	(0.276)	(0.301)
newUSA*lag1else	0.0721**	0.0720**	0.0719**	-0.0144	-0.0144	-0.0144
	(0.0298)	(0.0298)	(0.0298)	(0.0201)	(0.0201)	(0.0201)
core10	-0.527***	-0.527***	-0.528***	-0.387***	-0.387***	-0.387***
	(0.0113)	(0.0113)	(0.0113)	(0.0103)	(0.0103)	(0.0105)
newUSA*core10	-0.0619**	-0.0693**	-0.0680**	-0.124***	-0.125***	-0.125***
	(0.0271)	(0.0271)	(0.0271)	(0.0209)	(0.0210)	(0.0210)
fta*core10			-0.203			0.0188
			(0.315)			(0.223)
ftanewUSA*core10		-0.609	-0.406		-0.0984	-0.117
		(0.440)	(0.531)		(0.342)	(0.398)
lag_ln_real_ev				0.0493***	0.0493***	0.0493***
				(0.00146)	(0.00146)	(0.00146)
Year FE	No	No	No	Yes	Yes	Yes
Sector FE	No	No	No	Yes	Yes	Yes
ATPDEA and MFN dummies	No	No	No	Yes	Yes	Yes
N	31882	31882	31882	27434	27434	27434
r2_o	0.182	0.182	0.182	0.314	0.314	0.314
N_clust	2599	2599	2599	2599	2599	2599

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

B.5 Estimations Considering Transactions Greater than US$ 1,000

Table B.5.1: Model 1 - Intensive Margin - transactions greater than US$ 1,000

Dependent Variable	Δln_real_ev							
Estimation	Firm FE Robust							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
new_USA	2.606***	2.654***	2.380***	2.376***	1.365***	1.363***	1.225***	1.226***
	(0.332)	(0.335)	(0.334)	(0.334)	(0.293)	(0.295)	(0.289)	(0.289)
fta	-6.575*	-6.599*	-6.518*	-6.007	-2.376	-2.375	-2.294	-2.382
	(3.455)	(3.456)	(3.468)	(3.831)	(2.935)	(2.935)	(2.941)	(3.145)
fta*new_USA	10.07*	12.70*	14.07**	13.55*	4.972	4.849	5.295	5.387
	(5.876)	(6.944)	(7.016)	(7.194)	(4.742)	(5.760)	(5.681)	(5.789)
newUSA*lag2else	-2.951***	-2.925***			-1.231***	-1.232***		
	(0.498)	(0.502)			(0.415)	(0.417)		
lag1_core50	-4.522***	-4.528***	-4.436***	-4.455***	-2.186***	-2.185***	-2.141***	-2.138***
	(0.220)	(0.220)	(0.220)	(0.224)	(0.175)	(0.176)	(0.174)	(0.178)
newUSA*lag1core50	0.412	0.281	-0.117	-0.0981	-0.00775	-0.00158	-0.165	-0.168
	(0.399)	(0.410)	(0.428)	(0.428)	(0.352)	(0.361)	(0.360)	(0.362)
fta*lag1core50				-3.131				0.538
				(6.026)				(4.613)
ftanewUSA*lag1core50		-9.855	-11.96	-8.813		0.462	-0.361	-0.902
		(7.453)	(7.636)	(9.554)		(6.872)	(6.870)	(8.284)
lag_ln_real_ev_USA_tot					-0.612***	-0.612***	-0.613***	-0.613***
					(0.0229)	(0.0229)	(0.0229)	(0.0229)
Year FE	No	No	No	No	Yes	Yes	Yes	Yes
Sector FE	No	No	No	No	Yes	Yes	Yes	Yes
ATPDEA and MFN dummies	No	No	No	No	Yes	Yes	Yes	Yes
N	10765	10765	10765	10765	10765	10765	10765	10765
r2_o	0.0393	0.0393	0.0392	0.0392	0.201	0.201	0.201	0.201
N_clust	875	875	875	875	875	875	875	875

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table B.5.2: Model 2 - Extensive Margin (Entry) - transactions greater than US$ 1,000

Dependent Variable	Entry_ijt							
Estimation	LPM							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
new_USA	0.124***	0.123***	0.161***	0.161***	0.121***	0.120***	0.158***	0.158***
	(0.0288)	(0.0289)	(0.0322)	(0.0322)	(0.0286)	(0.0288)	(0.0321)	(0.0321)
fta	-0.521**	-0.516**	-0.788***	-0.787***	-0.400*	-0.394*	-0.663***	-0.663***
	(0.210)	(0.219)	(0.242)	(0.232)	(0.211)	(0.221)	(0.244)	(0.233)
fta*new_USA	1.406***	1.359***	1.530***	1.528***	1.380***	1.334***	1.503***	1.504***
	(0.427)	(0.439)	(0.510)	(0.504)	(0.428)	(0.440)	(0.508)	(0.502)
similar_prod	0.279***	0.279***	0.395***	0.395***	0.275***	0.274***	0.389***	0.389***
	(0.0186)	(0.0186)	(0.0251)	(0.0251)	(0.0186)	(0.0186)	(0.0253)	(0.0253)
ln_lag_n_sec_exp_USA					0.0976***	0.0975***	0.0929***	0.0929***
					(0.0179)	(0.0179)	(0.0176)	(0.0176)
gr_ln_real_sector_USA_exports					-0.0334*	-0.0334*	-0.0352**	-0.0352**
					(0.0178)	(0.0178)	(0.0178)	(0.0178)
newUSA*lag1else	0.0404	0.0417	0.0652	0.0652	0.0404	0.0417	0.0649	0.0649
	(0.0426)	(0.0427)	(0.0414)	(0.0414)	(0.0425)	(0.0426)	(0.0413)	(0.0413)
core50	0.548***	0.547***	0.563***	0.563***	0.544***	0.544***	0.560***	0.560***
	(0.0216)	(0.0222)	(0.0208)	(0.0202)	(0.0217)	(0.0223)	(0.0209)	(0.0202)
newUSA*core50	-0.0505	-0.0412	0.0666	0.0667	-0.0493	-0.0402	0.0668	0.0667
	(0.0418)	(0.0433)	(0.0454)	(0.0449)	(0.0416)	(0.0431)	(0.0453)	(0.0448)
fta*core50		-0.0699	0.0145			-0.0859	-0.00151	
		(0.483)	(0.491)			(0.483)	(0.490)	
ftanewUSA*core50		1.128	0.776	0.791		1.110	0.763	0.762
		(1.498)	(1.620)	(1.548)		(1.491)	(1.612)	(1.541)
core50*similar			-0.308***	-0.308***			-0.306***	-0.306***
			(0.0585)	(0.0585)			(0.0586)	(0.0586)
newUSA*similar			-0.237***	-0.237***			-0.233***	-0.233***
			(0.0401)	(0.0401)			(0.0402)	(0.0402)
fta*similar			1.804***	1.804***			1.793***	1.793***
			(0.421)	(0.419)			(0.421)	(0.419)
ftanewUSA*similar			-1.670**	-1.670**			-1.660**	-1.660**
			(0.675)	(0.674)			(0.675)	(0.674)
N	16466	16466	16466	16466	16466	16466	16466	16466
r2_o	0.136	0.136	0.147	0.147	0.138	0.138	0.149	0.149
N_clust	1054	1054	1054	1054	1054	1054	1054	1054

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table B.5.3: Model 3 - Exit (core competence in t) - transactions greater than US$ 1,000

Dependent Variable	Exit_ijt					
Estimation	LPM					
Column	(1)	(2)	(3)	(4)	(5)	(6)
new_USA	0.0695***	0.0715***	0.0704***	0.0660***	0.0665***	0.0663***
	(0.0230)	(0.0231)	(0.0231)	(0.0152)	(0.0153)	(0.0152)
fta	0.250	0.248	0.354	-0.00371	-0.00428	0.0122
	(0.281)	(0.281)	(0.320)	(0.180)	(0.180)	(0.199)
fta*new_USA	-0.0136	0.126	0.0157	0.170	0.204	0.187
	(0.440)	(0.480)	(0.502)	(0.272)	(0.289)	(0.301)
newUSA*lag1else	0.0292	0.0294	0.0295	-0.0469**	-0.0469**	-0.0469**
	(0.0293)	(0.0293)	(0.0294)	(0.0212)	(0.0212)	(0.0212)
core50	-0.567***	-0.567***	-0.571***	-0.380***	-0.380***	-0.381***
	(0.0132)	(0.0132)	(0.0132)	(0.0115)	(0.0115)	(0.0117)
newUSA*core50	0.0301	0.0201	0.0238	-0.0746***	-0.0769***	-0.0762***
	(0.0276)	(0.0282)	(0.0281)	(0.0216)	(0.0222)	(0.0221)
fta*core50			-0.641*			-0.0992
			(0.384)			(0.330)
ftanewUSA*core50		-0.889	-0.247		-0.207	-0.107
		(0.545)	(0.661)		(0.473)	(0.575)
lag_ln_real_ev				0.0496***	0.0495***	0.0495***
				(0.00152)	(0.00153)	(0.00153)
Year FE	No	No	No	Yes	Yes	Yes
Sector FE	No	No	No	Yes	Yes	Yes
ATPDEA and MFN dummies	No	No	No	Yes	Yes	Yes
N	17816	17816	17816	15368	15368	15368
r2_o	0.117	0.117	0.117	0.275	0.275	0.275
N_clust	2160	2160	2160	2160	2160	2160

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

C Appendix to Chapter 5

C.1 Derivation: Moments of x^A

The derivation of the moments of the random vector $x^A \equiv [x_1^A, \ldots, x_j^A, \ldots, x_J^A]$ is based on a previous work by Nguyen (2012). This vector is formed of an arbitrarily large number J of possible shipments of product A, and is normally distributed:

$$x^A \sim (0_J, \Xi). \tag{C.1a}$$

$$\Xi = \sigma_0^2 \begin{bmatrix} 1 & \rho & \ldots & \rho \\ \rho & 1 & \ldots & \rho \\ \ldots & \ldots & \ldots & \ldots \\ \rho & \rho & \ldots & 1 \end{bmatrix}. \tag{C.1b}$$

The vector x^A can be partitioned, defining $x^A = [x_1^A, x_I^A]$, where x_I^A is a vector of $J-1$ elements and x_1^A is a single element. As a result, matrix C.1b is partitioned as follows:

$$\Xi^I = \left[\begin{array}{c|ccc} 1 & \rho & \ldots & \rho \\ \hline \rho & 1 & \ldots & \rho \\ \ldots & \ldots & \ldots & \ldots \\ \rho & \rho & \ldots & 1 \end{array}\right] = \begin{bmatrix} 1 & \Xi_{1I} \\ \Xi_{I1} & \Xi_{II} \end{bmatrix}. \tag{C.2}$$

Since, from Equation 5.9a, at the initial stage of the decision-making process in market d, $E[x^A] = E[x^B] = 0$, and the firm decides on B given its previous shipments of A, I can take the single element x_1^A as the perceived demand from the first shipment of product B, x_1^B. Then, following a theorem on *Marginal and Conditional Normal Distributions*, explained at the *Econometric Analysis* textbook by Greene (2012), I can calculate the conditional distribution of x_1^B given x_I^A, which is normal with the following moments:

$$E[x_1^B \mid x_I^A] = \Xi_{1I}\Xi_{II}^{-1}x_I^A. \tag{C.3a}$$

$$Var[x_1^B \mid x_I^A] = \sigma_0^2 \ - \Xi_{1I}\Xi_{II}^{-1}\Xi_{I1}. \tag{C.3b}$$

Subsequently, I follow Nguyen (2011), guided by a previous work by Paltseva (2010), in order to simplify the term $\Xi_{1I}\Xi_{II}^{-1}$. The challenge is to obtain the inverse matrix of Ξ_{II}^{-1}. Paltseva (2010) achieved the following simplification:

$$\Xi_{1I}\Xi_{II}^{-1} = \frac{[\rho\ \dots\ \dots\ \rho]}{(1-\rho)(1+(I-1)\rho)} \begin{bmatrix} 1+(I-2)\rho & -\rho & \dots & -\rho \\ -\rho & 1+(I-2)\rho & \dots & -\rho \\ \dots & \dots & \dots & \dots \\ -\rho & -\rho & \dots & 1+(I-2)\rho \end{bmatrix} \tag{C.4}$$
$$= \frac{\rho}{(1+(I-1)\rho)}[1\ \dots\ \dots\ 1].$$

By that simplification, I can rewrite the moments from Equations C.3a and C.3b:

$$E[x_1^B \mid x_I^A] = \Xi_{1I}\Xi_{II}^{-1}x_I^A = \frac{\rho\Sigma_{i\in I_A}x_i^A}{(1+(I-1)\rho)}. \tag{C.5a}$$
$$Var[x_1^B \mid x_I^A] = \sigma_0^2\ - \Xi_{1I}\Xi_{II}^{-1}\Xi_{I1} = \sigma_0^2\left(1 - \frac{I\rho^2}{(1+(I-1)\rho)}\right). \tag{C.5b}$$

Note that if I multiply both the numerator and denominator of Equation C.5a by I_A, I obtain the expected value of x^B given I_A of Equation 5.11a. Additionally, the denominator $(1+(I-1)\rho)$ is a rearrangement of $I_A\rho + (1-\rho)$ from Equations 5.11a and 5.11b.

C.2 OLS Estimations: First and Second Experimentation Rounds

Table C.2.1: N° Shipments by Peruvian Firms to USA Before Second Experimentation Round in That Market

Dependent Variable	num_shipments_USA							
Estimation	OLS							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
postfta	-0.119*	0.368	-0.139*	-0.135	-0.119*	0.352	-0.130*	-0.274
	(0.0640)	(0.284)	(0.0741)	(0.329)	(0.0638)	(0.284)	(0.0739)	(0.356)
mean_export_USA	0.0653**	0.0939***	0.0653**	0.0250	0.0615**	0.0833**	0.0615**	0.00901
	(0.0291)	(0.0325)	(0.0291)	(0.0380)	(0.0295)	(0.0327)	(0.0294)	(0.0384)
postfta*export_USA		-0.0614*		0.0112		-0.0586*		0.0115
		(0.0333)		(0.0386)		(0.0333)		(0.0381)
new_wmean_tariff		-0.824		0.896				
		(0.825)		(1.098)				
postfta*tariff		0.699		-1.040				
		(0.931)		(1.170)				
new_wpref					0.243**	0.192	0.242**	0.188
					(0.0966)	(0.124)	(0.0977)	(0.149)
postfta*pref						0.0752		0.0843
						(0.141)		(0.165)
pre_postfta			-0.0401	-0.813**			-0.0221	-1.123***
			(0.0926)	(0.365)			(0.0934)	(0.407)
pre_postfta*export_USA				0.117***				0.128***
				(0.0449)				(0.0457)
pre_postfta*tariff				-2.967**				
				(1.351)				
pre_postfta*pref								0.0262
								(0.202)
Sector FE / Other Regressors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	No	No	Yes	No	Yes
N	1117	1108	1117	1108	1115	1115	1115	1115
r2_o	0.0470	0.0579	0.0472	0.0610	0.0535	0.0624	0.0535	0.0699
F	6.512	3.744	5.885	4.828	6.762	4.335	6.233	4.094

Robust standard errors controlling for heteroskedasticity.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table C.2.2: N° Shipments by Peruvian Firms Abroad Before First Experimentation Round in the USA Market

Dependent Variable	num_shipments_total							
Estimation	OLS							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
postfta	0.0426	0.618	0.264**	1.428**	0.0294	0.523	0.240*	1.102*
	(0.108)	(0.608)	(0.126)	(0.710)	(0.108)	(0.589)	(0.126)	(0.640)
mean_export_total	0.0895*	0.140***	0.0949**	0.0624	0.0973**	0.138**	0.102**	0.0609
	(0.0473)	(0.0536)	(0.0478)	(0.0682)	(0.0477)	(0.0541)	(0.0481)	(0.0681)
postfta*export_total		-0.0904		-0.0141		-0.0930		-0.0174
		(0.0599)		(0.0674)		(0.0600)		(0.0669)
new_wmean_tariff		3.205**		4.155**				
		(1.392)		(1.813)				
postfta*tariff		-0.646		-1.546				
		(1.638)		(2.035)				
new_wpref					-0.453***	-0.514***	-0.434***	-0.542**
					(0.148)	(0.189)	(0.146)	(0.245)
postfta*pref						0.196		0.220
						(0.220)		(0.269)
pre_postfta			0.397**	0.0602			0.377**	-0.225
			(0.155)	(0.930)			(0.154)	(0.881)
pre_postfta*export_total				0.164*				0.160*
				(0.0901)				(0.0899)
pre_postfta*tariff				-1.802				
				(2.315)				
pre_postfta*pref								0.0796
								(0.315)
Sector FE / Other Regressors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
N	813	807	813	807	809	809	809	809
r2_o	0.109	0.142	0.116	0.148	0.120	0.146	0.127	0.150
F	13.24	7.624	12.43	7.499	13.45	7.872	12.59	7.779

Robust standard errors controlling for heteroskedasticity.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table C.2.3: N° Shipments by Peruvian Firms Abroad Before Second Experimentation Round in the USA Market

Dependent Variable	num_shipments_total							
Estimation	OLS							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
postfta	-0.228***	0.404	-0.0430	0.158	-0.228***	0.375	-0.0318	0.0902
	(0.0780)	(0.368)	(0.0887)	(0.414)	(0.0779)	(0.375)	(0.0883)	(0.407)
mean_export_total	0.109***	0.149***	0.106***	0.0650	0.104***	0.138***	0.101***	0.0467
	(0.0336)	(0.0379)	(0.0336)	(0.0450)	(0.0343)	(0.0384)	(0.0344)	(0.0452)
postfta*export_total		-0.112***		-0.0204		-0.107***		-0.00845
		(0.0412)		(0.0478)		(0.0413)		(0.0472)
new_wmean_tariff		-0.878		-0.309				
		(1.214)		(1.339)				
postfta*tariff		0.563		-0.125				
		(1.318)		(1.438)				
new_wpref					0.247**	0.238*	0.268**	0.355**
					(0.117)	(0.144)	(0.116)	(0.176)
postfta*pref						0.0395		-0.0608
						(0.170)		(0.197)
pre_postfta			0.370***	-0.897*			0.392***	-0.977*
			(0.113)	(0.499)			(0.113)	(0.507)
pre_postfta*export_total				0.156***				0.170***
				(0.0578)				(0.0579)
pre_postfta*tariff				-1.058				
				(2.077)				
pre_postfta*pref								-0.189
								(0.243)
Sector FE / Other Regressors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	No	No	Yes	No	No
N	1117	1108	1117	1108	1115	1115	1115	1115
r2_o	0.130	0.154	0.139	0.151	0.133	0.157	0.143	0.155
F	18.59	9.988	17.55	12.52	17.08	10.25	16.37	12.82

Robust standard errors controlling for heteroskedasticity.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

C.3 Panel Data Regressions - Fixed Effects at Firm Level

Table C.3.1: N° Shipments by Peruvian Firms to USA Before Introduction of New Export to That Market

Dependent Variable	num_shipments_USA							
Estimation	Panel Fixed Effects							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
mean_export_USA	0.177***	0.160***	0.117***	0.0632***	0.175***	0.158***	0.118***	0.117***
	(0.0212)	(0.0214)	(0.0226)	(0.0208)	(0.0211)	(0.0214)	(0.0231)	(0.0275)
postfta*export_USA	-0.0163	0.00359	0.0470*	0.00915	-0.0157	0.00462	0.0442	0.0454
	(0.0255)	(0.0253)	(0.0267)	(0.0209)	(0.0255)	(0.0253)	(0.0272)	(0.0301)
new_wmean_tariff	0.207	0.525	0.514	-0.158				
	(0.402)	(0.417)	(0.647)	(0.614)				
postfta*tariff	-0.707	-0.833	-0.987	-0.685				
	(0.518)	(0.524)	(0.718)	(0.660)				
new_wpref					-0.0518	-0.0420	-0.0949	-0.0986
					(0.0631)	(0.0643)	(0.0925)	(0.0975)
postfta*pref					0.183**	0.159**	0.222**	0.216**
					(0.0812)	(0.0808)	(0.104)	(0.107)
pre_postfta*export_USA			0.0793***	0.106***			0.0732***	0.0593**
			(0.00891)	(0.0222)			(0.0102)	(0.0266)
pre_postfta*tariff			-0.283	0.470				
			(0.693)	(0.734)				
pre_postfta*pref							0.0741	0.0756
							(0.0947)	(0.0982)
Sector FE / Other Regressors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
N	5009	5009	5009	5009	5028	5028	5028	5028
r2_o	0.0491	0.0284	0.0523	0.0370	0.0436	0.0226	0.0457	0.0314
N_clust	1115	1115	1115	1115	1117	1117	1117	1117

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table C.3.2: N° Shipments by Peruvian Firms Abroad Before Introduction of New Exports to the USA Market

Dependent Variable	num_shipments_total							
Estimation	Panel Fixed Effects							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
mean_export_total	0.232***	0.194***	0.147***	0.134***	0.233***	0.193***	0.153***	0.130***
	(0.0271)	(0.0283)	(0.0285)	(0.0330)	(0.0269)	(0.0282)	(0.0293)	(0.0329)
postfta*export_total	-0.0281	0.00997	0.0566*	0.0692*	-0.0289	0.0106	0.0496	0.0715**
	(0.0318)	(0.0329)	(0.0328)	(0.0360)	(0.0318)	(0.0328)	(0.0338)	(0.0359)
new_wmean_tariff	0.227	0.689	0.792	0.846				
	(0.443)	(0.458)	(0.726)	(0.717)				
postfta*tariff	-0.675	-0.877	-1.210	-1.034				
	(0.575)	(0.582)	(0.807)	(0.795)				
new_wpref					-0.0665	-0.0348	-0.147	-0.147
					(0.0699)	(0.0695)	(0.0964)	(0.0994)
postfta*pref					0.149	0.117	0.227**	0.230**
					(0.0958)	(0.0934)	(0.115)	(0.116)
pre_postfta*export_total			0.0985***	0.0892***			0.0864***	0.0911***
			(0.00939)	(0.0313)			(0.0101)	(0.0310)
pre_postfta*tariff			-0.579	-0.212				
			(0.768)	(0.791)				
pre_postfta*pref							0.156	0.167
							(0.100)	(0.103)
Sector FE / Other Regressors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
N	5826	5826	5826	5826	5847	5847	5847	5847
r2_o	0.0447	0.0326	0.0580	0.0449	0.0422	0.0277	0.0530	0.0408
F	1563	1563	1563	1563	1564	1564	1564	1564

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

C.4 Cox Proportional Hazard Model - No Shared Frailty at Firm Level

Table C.4.1: Peruvian Firms' Probability of Introducing New Exports to USA (Hazard Ratios)

Excluding First Experimentation Rounds

Time Spell	Days After Firm i's Last Experimentation Round in USA							
Estimation	Cox Proportional Hazard Model							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
postfta	1.336***	1.447*	0.851***	0.340***	1.335***	1.673***	0.850***	0.383***
	(0.0677)	(0.289)	(0.0458)	(0.0763)	(0.0677)	(0.317)	(0.0458)	(0.0800)
mean_export_USA	0.898***	0.908***	0.899***	0.911***	0.898***	0.909***	0.899***	0.913***
	(0.0149)	(0.0166)	(0.0145)	(0.0215)	(0.0148)	(0.0165)	(0.0144)	(0.0212)
postfta*export_USA		1.022		1.019		1.020		1.015
		(0.0206)		(0.0247)		(0.0205)		(0.0243)
new_wmean_tariff		0.808		1.116				
		(0.309)		(0.650)				
postfta*tariff		3.156**		2.295				
		(1.567)		(1.467)				
new_wpref					0.913**	0.964	0.902**	1.022
					(0.0395)	(0.0515)	(0.0388)	(0.0809)
postfta*pref						0.903		0.850*
						(0.0685)		(0.0776)
pre_postfta			0.530***	0.250***			0.529***	0.242***
			(0.0327)	(0.0627)			(0.0327)	(0.0573)
pre_postfta*export_USA				0.993				0.991
				(0.0256)				(0.0252)
pre_postfta*tariff				0.596				
				(0.433)				
pre_postfta*pref								0.918
								(0.0911)
FE_2009		0.383***		1.867***		0.372***		1.854***
		(0.0374)		(0.125)		(0.0369)		(0.124)
FE_2010		0.295***		1.428***		0.288***		1.433***
		(0.0305)		(0.0917)		(0.0303)		(0.0922)
FE_2011		0.236***		1.148**		0.232***		1.155***
		(0.0246)		(0.0626)		(0.0244)		(0.0627)
Sector FE / Other Regressors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
N	5052	5025	5052	5025	5044	5044	5044	5044
N_clust	1118	1116	1118	1116	1118	1118	1118	1118
chi2	213.7	773.9	259.8	777.0	215.8	772.6	267.1	772.6

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table C.4.2: Peruvian Firms' Probability of Introducing New Exports to USA (Hazard Ratios)

Including First Experimentation Rounds

Time Spell	Days After Firm i's Last Experimentation Round in USA or Entry into Business (1st Round)							
Estimation	Cox Proportional Hazard Model							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
postfta	1.368***	1.329	0.889**	0.265***	1.366***	1.540**	0.888**	0.308***
	(0.0701)	(0.273)	(0.0460)	(0.0579)	(0.0700)	(0.302)	(0.0459)	(0.0644)
mean_export_total	0.892***	0.907***	0.891***	0.924***	0.893***	0.907***	0.892***	0.924***
	(0.0136)	(0.0167)	(0.0135)	(0.0208)	(0.0135)	(0.0167)	(0.0134)	(0.0208)
postfta*export_total		1.048**		1.025		1.046**		1.023
		(0.0216)		(0.0244)		(0.0215)		(0.0244)
new_wmean_tariff		0.866		0.789				
		(0.318)		(0.409)				
postfta*tariff		3.374***		3.597**				
		(1.582)		(2.046)				
new_wpref					0.922**	0.985	0.909**	1.065
					(0.0359)	(0.0499)	(0.0353)	(0.0762)
postfta*pref						0.902		0.835**
						(0.0626)		(0.0679)
pre_postfta			0.535***	0.244***			0.534***	0.249***
			(0.0329)	(0.0599)			(0.0328)	(0.0575)
pre_postfta*export_total				0.960				0.960
				(0.0238)				(0.0237)
pre_postfta*tariff				0.996				
				(0.652)				
pre_postfta*pref								0.875
								(0.0801)
FE_2009		0.329***		2.307***		0.324***		2.302***
		(0.0297)		(0.157)		(0.0294)		(0.157)
FE_2010		0.240***		1.676***		0.236***		1.681***
		(0.0236)		(0.103)		(0.0234)		(0.104)
FE_2011		0.186***		1.296***		0.184***		1.309***
		(0.0185)		(0.0694)		(0.0185)		(0.0698)
Sector FE / Other Regressors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
N	5865	5832	5865	5832	5853	5853	5853	5853
N_clust	1566	1563	1566	1563	1564	1564	1564	1564
chi2	254.8	2355.4	298.0	2299.9	262.2	2309.2	310.8	2254.5

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

C.5 Cox Proportional Hazard Model - First and Second Experimentation Rounds

Table C.5.1: Peruvian Firms' Probability of Introducing New Exports to USA - Second Experimentation Round (Hazard Ratios)

Time Spell	Days After Firm i's First Experimentation Round in USA							
Estimation	Cox Proportional Hazard Model							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
postfta	1.451***	1.905**	0.835**	0.226***	1.448***	2.333***	0.831**	0.285***
	(0.0893)	(0.547)	(0.0600)	(0.0787)	(0.0891)	(0.644)	(0.0606)	(0.0947)
mean_export_USA	0.936**	0.917***	0.927***	0.921***	0.938**	0.918***	0.929***	0.920***
	(0.0240)	(0.0229)	(0.0234)	(0.0293)	(0.0238)	(0.0229)	(0.0233)	(0.0293)
postfta*export_USA		1.052*		1.047		1.046		1.043
		(0.0322)		(0.0367)		(0.0318)		(0.0369)
new_wmean_tariff		0.965		0.681				
		(0.750)		(0.725)				
postfta*tariff		5.260*		7.416*				
		(4.905)		(8.635)				
new_wpref					0.851*	0.875	0.834**	0.954
					(0.0705)	(0.0866)	(0.0702)	(0.127)
postfta*pref						0.902		0.829
						(0.118)		(0.128)
pre_postfta			0.379***	0.119***			0.377***	0.130***
			(0.0321)	(0.0424)			(0.0324)	(0.0460)
pre_postfta*export_USA				0.992				0.994
				(0.0363)				(0.0367)
pre_postfta*tariff				1.885				
				(2.495)				
pre_postfta*pref								0.850
								(0.148)
FE_2009		0.396***		3.354***		0.387***		3.312***
		(0.0591)		(0.434)		(0.0585)		(0.427)
FE_2010		0.230***		1.958***		0.230***		1.981***
		(0.0368)		(0.236)		(0.0372)		(0.240)
FE_2011		0.163***		1.381***		0.161***		1.385***
		(0.0260)		(0.163)		(0.0261)		(0.163)
Sector FE / Other Regressors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
N	1118	1109	1118	1109	1116	1116	1116	1116
R2_p	0.0107	0.0277	0.0190	0.0277	0.0110	0.0278	0.0194	0.0278
chi2	134.2	367.6	238.5	370.8	143.2	366.4	245.7	373.1

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table C.5.2: Peruvian Firms' Probability of Introducing New Exports to USA - First Experimentation Round (Hazard Ratios)

Time Spell	Days After Firm i's Entry into Business							
Estimation	Cox Proportional Hazard Model							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
postfta	2.291***	10.73***	0.654***	0.0300***	2.282***	12.12***	0.651***	0.0394***
	(0.169)	(3.956)	(0.0550)	(0.0138)	(0.169)	(4.227)	(0.0553)	(0.0171)
mean_export_total	0.988	0.922**	0.970	0.940	0.987	0.925**	0.970	0.957
	(0.0317)	(0.0309)	(0.0316)	(0.0374)	(0.0316)	(0.0312)	(0.0317)	(0.0393)
postfta*export_total		1.045		1.023		1.039		1.006
		(0.0393)		(0.0436)		(0.0388)		(0.0431)
new_wmean_tariff		7.108**		2.121				
		(6.271)		(2.583)				
postfta*tariff		2.773		9.111*				
		(2.928)		(12.13)				
new_wpref					1.023	0.886	0.964	0.886
					(0.0949)	(0.109)	(0.0998)	(0.152)
postfta*pref						1.002		1.003
						(0.147)		(0.186)
pre_postfta			0.133***	0.00337***			0.133***	0.00464***
			(0.0140)	(0.00181)			(0.0140)	(0.00239)
pre_postfta*export_total				0.952				0.931
				(0.0476)				(0.0464)
pre_postfta*tariff				8.207				
				(11.56)				
pre_postfta*pref								0.994
								(0.191)
FE_2009		0.0549***		21.30***		0.0526***		21.55***
		(0.0107)		(3.732)		(0.00998)		(3.747)
FE_2010		0.0195***		7.580***		0.0183***		7.460***
		(0.00395)		(1.197)		(0.00360)		(1.173)
FE_2011		0.0117***		4.511***		0.0111***		4.520***
		(0.00245)		(0.693)		(0.00227)		(0.694)
Sector FE / Other Regressors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
N	813	807	813	807	809	809	809	809
R2_p	0.0140	0.0849	0.0423	0.0852	0.0138	0.0836	0.0423	0.0838
chi2	138.6	934.1	411.5	938.8	136.7	904.4	409.5	908.0

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.

Table C.5.3: Peruvian Firms' Probability of Introducing New Exports to USA - Second Experimentation Round (Hazard Ratios)

Time Spell	Days After Firm i's First Experimentation Round in USA							
Estimation	Cox Proportional Hazard Model							
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
postfta	1.443***	1.372	0.833**	0.160***	1.440***	1.732*	0.830**	0.205***
	(0.0885)	(0.429)	(0.0596)	(0.0599)	(0.0883)	(0.529)	(0.0603)	(0.0727)
mean_export_total	0.917***	0.890***	0.913***	0.889***	0.919***	0.892***	0.916***	0.889***
	(0.0241)	(0.0231)	(0.0243)	(0.0289)	(0.0240)	(0.0231)	(0.0242)	(0.0289)
postfta*export_total		1.090**		1.090**		1.082**		1.086**
		(0.0365)		(0.0420)		(0.0360)		(0.0418)
new_wmean_tariff		0.792		0.606				
		(0.613)		(0.645)				
postfta*tariff		6.086*		7.941*				
		(5.637)		(9.232)				
new_wpref					0.854*	0.894	0.837**	0.974
					(0.0713)	(0.0888)	(0.0708)	(0.130)
postfta*pref						0.878		0.808
						(0.114)		(0.126)
pre_postfta			0.382***	0.113***			0.380***	0.121***
			(0.0323)	(0.0448)			(0.0326)	(0.0484)
pre_postfta*export_total				1.002				1.005
				(0.0410)				(0.0418)
pre_postfta*tariff				1.674				
				(2.205)				
pre_postfta*pref								0.853
								(0.149)
FE_2009		0.405***		3.388***		0.397***		3.352***
		(0.0612)		(0.434)		(0.0603)		(0.427)
FE_2010		0.233***		1.956***		0.233***		1.984***
		(0.0376)		(0.236)		(0.0378)		(0.240)
FE_2011		0.164***		1.375***		0.162***		1.377***
		(0.0266)		(0.164)		(0.0265)		(0.163)
Sector FE / Other Regressors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes	No	Yes
N	1118	1109	1118	1109	1116	1116	1116	1116
R2_p	0.0110	0.0282	0.0192	0.0282	0.0112	0.0283	0.0195	0.0283
chi2	136.0	370.9	241.1	375.4	143.5	371.2	248.5	380.9

Robust standard errors adjusted for clusters in firms.

*Denotes statistical significance at the 10% level; **Denotes statistical significance at the 5% level;

***Denotes statistical significance at the 1% level.